OCCUPATIONAL ANALYSES SERIES

Industrial Electrician

2003

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Occupational Analyses Series

Industrial Electrician

2003

Policy and Apprenticeship Division
Human Resources
Partnerships Directorate

Division des politiques et de l'apprentissage
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The Canadian Council of Directors of Apprenticeship (CCDA) recognizes this Occupational Analysis as the national standard for the occupation of Industrial Electrician.

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OTHER RELATED OCCUPATIONAL TITLES

This analysis covers tasks performed by an industrial electrician whose occupational title has been identified by some provinces and territories of Canada under the following names:

- Electrician (Non-Construction)
- Industrial Electrical

LIST OF PUBLISHED OCCUPATIONAL ANALYSES *

TITLE	NOC** Code
Appliance Service Technician (1997)	7332
Aquaculture Technician (1977)	2221
Arts Administrator (1989)	0114
Automotive Painter (1995)	7322
Automotive Service Technician (1998)	7321
Automotive Technician - Automatic Transmission (1990)	7321
Automotive Technician - Electrical/Electronics (1992)	7321
Automotive Technician - Engine Repair and Fuel Systems (1989)	7321
Automotive Technician - Front-End (1989)	7321
Automotive Technician - Manual Transmission, Driveline and Brakes (1990)	7321
Aviation Machinist (1994)	7231
Baker (1997)	6252
Blaster (Surface) (1987)	7372
Boilermaker (2003)	7262
Bricklayer (2000)	7281
Cabinetmaker (2000)	7272
Carpenter (1998)	7271
Cement Finisher (1995)	7282
Construction Electrician (2003)	7241
Cook (2003)	6242
Electrical Rewind Mechanic (1999)	7333
Electronics Technician - Consumer Products (1997)	2242
Electronics Technician Vol. I (1986) (Video Equipment)	2242
Electronics Technician Vol. II (1986) (Audio Equipment)	2242
Electronics Technician Vol. III (1986) (Computer Equipment)	2242

* **Red Seal analyses are indicated in bold**

** **National Occupational Classification**

TITLE	NOC** Code
Electronics Technician Vol. IV (1986) (Office Equipment)	2242
Electronics Technician Vol. VI (1986) (Communication Equipment)	2242
Electronics Technician Vol. VII (1986) (Signaling Equipment)	2242
Electronics Technician Vol. VIII (1986) (Navigation Equipment)	2242
Electronics Technician Vol. IX (1986) (Video Game Equipment)	2242
Electronics Technician Vol. X (1987) (CADD Equipment)	2242
Electronics Technician Vol. XI (1987) (CAM Equipment)	2242
Electronics Technician Vol. XII (1987) (Robotics Equipment)	2242
Electronics Technician Vol. XIII (1987) (Biomedical and Laboratory Equipment)	2242
Electronics Technician Vol. XIV (1987) (Industrial Process-Control Equipment)	2243
Farm Equipment Mechanic (2000)	7312
Floorcovering Installer (1997)	7295
Glazier (1994)	7292
Hairstylist (1997)	6271
Heating (Gas and Oil) Servicer - Commercial and Industrial (1978)	7331
Heavy Duty Equipment Mechanic (1998)	7312
Industrial Electrician (2003)	7242
Industrial Instrument Mechanic (2000)	2243
Industrial Mechanic (Millwright) (1999)	7311
Insulator (Heat and Frost) (2000)	7293
Ironworker (Generalist) (1993)	7264
Lather (Interior Systems Mechanic) (2002)	7284

TITLE	NOC**Code
Logistics (1992)	0713
Machinist (1998)	7231
Major Electrical Appliance Repairer (1984)	7332
Metal Fabricator (Fitter) (2003)	7263
Mobile Crane Operator (1997)	7371
Motorcycle Mechanic (1995)	7334
Motor Vehicle Body Repairer (Metal and Paint) (1997)	7322
New Home Builder and Residential Renovation Contractor (1992)	0712
Oil Burner Mechanic (1997)	7331
Painter and Decorator (2000)	7294
Partsperson (1995)	1472
Plumber (2003)	7251
Power Engineer (1997)	7351
Powerline Technician (1996)	7244
Recreation Vehicle Mechanic (2000)	7383
Refrigeration and Air Conditioning Mechanic (1997)	7313
Roofer (1997)	7291
Sheet Metal Worker (1997)	7261
Sprinkler System Installer (2003)	7252
Steamfitter-Pipefitter (1996)	7252
Tool and Die Maker (1997)	7232
Transport Trailer Technician (2003)	7321
Truck and Transport Mechanic (2000)	7321
Welder (1996)	7265

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Gatineau, Quebec, K1A 0J9

FOREWORD

The first National Conference on Apprenticeship in Trades and Industries, held in Ottawa in 1952, recommended that the federal government be requested to co-operate with provincial apprenticeship committees and officials in preparing analyses of a number of skilled occupations. To this end, Human Resources Development Canada sponsors a program, under the guidance of the Canadian Council of Directors of Apprenticeship (CCDA), to develop a series of occupational analyses.

The Occupational Analysis Program has the following objectives:

- to identify and group the tasks performed by skilled workers in particular occupations;

- to identify those tasks that are performed by skilled workers in every province and territory;

- to develop instruments for use in the preparation of interprovincial standards "Red Seal" examinations and curricula for training leading to the certification of skilled workers;

- to facilitate the mobility, in Canada, of trainees and skilled workers;

- to supply employers and employees, and their associations, industries, training institutions and governments with analyses of the tasks performed in particular occupations.

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GUIDE TO ANALYSIS

DEVELOPMENT OF ANALYSIS

A draft analysis is developed by a knowledgeable consultant who, with the assistance of a committee of industry experts in the field, identifies all the tasks performed in the occupation.

The draft is then assigned to occupational analysts at Human Resources Development Canada for translation and then returned to the consultant for review to ensure conformity with the nationally approved format.

The consultant will then forward a copy of this analysis to provincial/territorial authorities for validation by specialists in the field. Their recommendations are assessed and incorporated into the final draft which also includes the identification of the common core tasks performed in the occupation.

The occupational analysis is published in both official languages.

STRUCTURE OF ANALYSIS

To facilitate understanding of the nature of the occupation, the work performed is divided into the following divisions:

A. **BLOCK** - is the largest division within the analysis and reflects a distinct operation relevant to the occupation.

B. **TASK** - is the distinct activity that, combined with others, makes up the logical and necessary steps the worker is required to perform to complete a specific assignment within a "BLOCK".

C. **SUB-TASK** - is the smallest division into which it is practical to subdivide any work activity and, combined with others, fully describes all duties constituting a "TASK".

Supporting Knowledge & Abilities

The elements of skill and knowledge that an individual must acquire to adequately perform the task are identified under this heading.

Trends

Any shifts or changes in technology that affects the block are identified under this heading.

Related Components

All components of a specified task being undertaken by the industrial electrician are identified under this heading.

Tools and Equipment

All tools and equipment necessary for the industrial electrician to complete a task are identified under this heading.

VALIDATION METHOD

At the request of the Canadian Council of Directors of Apprenticeship (CCDA), the Standardization Sub-committee developed a method for the validation of the Red Seal national occupational analyses.

A draft of the analysis is sent to all provinces/territories for validation. Each jurisdiction rates the sub-tasks and applies percentage ratings to blocks and tasks. This method for the validation of the national occupational analysis identifies common core tasks across Canada for a specific occupation. This feature facilitates the weighting of the Interprovincial Red Seal examinations.

DEFINITIONS

YES:	the sub-task is performed by workers in the occupation in a specific jurisdiction.
NO:	the sub-task is not performed by workers in the occupation in a specific jurisdiction.
BLOCK %:	the average number of questions (items), derived from the collective decision made by workers within the occupation from all areas of Canada, which will be placed on an interprovincial examination to assess each block of the analysis.
TASK %:	the average number of questions (items), derived from the collective decision made by workers within the occupation from all areas of Canada, which will be placed on an interprovincial examination to assess each task of the analysis.
NV:	Not Validated by a province/territory.
ND:	Not Designated in a province/territory.

PROVINCIAL/TERRITORIAL ABBREVIATIONS

NL:	Newfoundland and Labrador
NS:	Nova Scotia
PE:	Prince Edward Island
NB:	New Brunswick
QC:	Quebec
ON:	Ontario
MB:	Manitoba
SK:	Saskatchewan
AB:	Alberta
BC:	British Columbia
NT:	Northwest Territories
YK:	Yukon
NU:	Nunavut

COMMON CORE

The criteria for determining common core depend on the performance of sub-tasks. If 70 percent of the responding jurisdictions (excluding NVs and NDs) perform the sub-task, it shall be considered common core.

Interprovincial Red Seal examinations are based on the common core identified through this validation process. This process identifies what will be assessed through the interprovincial examination.

BLOCKS AND TASKS WEIGHTING (APPENDIX "C")

This appendix represents the block and task percentages as submitted by each jurisdiction.

Each jurisdiction, with the use of a provincial/territorial occupational advisory committee, validates the content, places percentages on blocks and tasks, and indicates whether or not the sub-tasks are performed by the skilled workers within the occupation. The results of this exercise are submitted to the consultant who then analyses the data and develops this appendix which provides the individual jurisdictional validation results as well as the national averages of all responses.

PIE CHART (APPENDIX "D")

The graph depicts the national percentages assigned to blocks in the analysis.

SCOPE OF THE INDUSTRIAL ELECTRICIAN OCCUPATION

This National occupational analysis has been developed for work performed by industrial electricians. An industrial electrician is a skilled individual who must possess fundamental and specialized knowledge and skills related to the installation and maintenance of electrical devices and components found in industrial settings. Industrial electricians inspect, install, troubleshoot, repair and service (includes calibration and preventive/predictive maintenance) electrical equipment such as motors, generators, pumps, heavy duty machines, illumination systems, environmental regulating systems, communication systems; and associated electrical and electronic controls.

Individuals who work in this trade are also referred to as marine, mill or mine electricians, maintenance electricians, or plant electricians. These trade persons are employed by maintenance departments of factories, plants, mines, shipyards, oil and gas rigs, as well as platforms, and other industrial enterprises.

Some of the tasks and sub-tasks associated with the analysis overlap with the responsibilities of other skilled trades. Possible overlap exists in trades such as: Construction Electrician; Domestic, Rural and Low-rise Residential Electrician; Facilities Technician/Mechanic; Millwright; Stationary Engineer; and Instrumentation Technician/Mechanic.

Trade certification is compulsory in some jurisdictions while available, but voluntary, in others. Where certification is not required for the trade, codes, standards and regulations still apply. Electrical contractors in Canada require a Construction and Maintenance License.

OCCUPATIONAL OBSERVATIONS

The digital revolution has brought the development of technologies that have influenced the trade of Industrial Electrician. The wide spread use of personal computers, the installation of hi-tech alarm systems, fiber optics, the expanded data requirements, and the wide spread reliance on computer aided manufacturing has resulted in a change in the work accomplished by an industrial electrician. More repair information is available on the Internet which makes for a more effective and up-to-date distribution system for repair procedures and methods. Parts and parts inventory can be more easily managed and accessed through the use of electronic management systems.

The use of robots and other computerized control equipment prevalent in the automobile and other manufacturing sectors requires electricians who can install and repair this equipment. The integration of programmable logic controllers (PLC) with more traditional controllers continues. The replacement of components is now much more common than bench repairs. The trade has been influenced by enhancements and developments in diagnostic equipment. The result of new technology has been a reduction in the physical requirements of the trade and an increase in the specialized knowledge requirements.

As the need for cross-functional workers continues in industry, the flexibility and diversity of tasks accomplished by industrial electricians continues to expand. There is now and continues to be, an increase in overlap among the skills required by the Industrial Electrician trade and those of construction, millwright, and instrumentation trades.

SAFETY

Safe working procedures and conditions, accident prevention and the preservation of health are of primary importance to industry in Canada. These responsibilities are shared and require the joint efforts of government, employers and employees. It is imperative that all parties become aware of circumstances that may lead to injury or harm. Safe learning experiences and environments can be created by controlling the variables and behaviours that may contribute to accidents or injuries.

It is generally recognized that a safety-conscious attitude and work practices contribute to a healthy, safe and accident-free working environment.

It is imperative to apply and be familiar with the Canadian Occupational Health and Safety Act and Regulations. As well, it is essential to determine workplace hazards and take measures to protect oneself, co-workers, the public and the environment.

As safety education is an integral part of training in all jurisdictions, personal safety practices are not recorded in this document. However, the technical safety aspect relating to each task and sub-task is included throughout this analysis.

ANALYSIS

BLOCK A

OCCUPATIONAL SKILLS

Trends: *None.*

Task 1 **Utilizes drawings, codes, standards and service and operating manuals.**

Related Components: Structural drawings, power distribution drawings, wiring diagrams, electrical and electronic schematics, Piping and Instrumentation Drawings (P and ID), layout drawings, blueprints, service manuals, operating manuals, safety manuals, technical bulletins, standard operating procedures, federal and provincial regulations, federal, provincial, and municipal electrical codes, amendments, ECUSR, IEEE, CSA, ULC and ISA standards.

Tools and Equipment: Computer, CAD software, rulers, printers, scanners, plotters, loop sheets, flow diagrams, DVD/CD Rom, multi-media projectors and VCR players.

Sub-task

1.01 **Interprets blueprints, drawings and schematics.**

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

1.01.01 knowledge of types and formats of drawings and schematics

1.01.02 knowledge of information contained on drawings and schematics such as dimensions, tolerances and components

1.01.03 ability to recognize symbols and abbreviations

1.01.04 ability to calculate dimensions

1.01.05 ability to visualize three dimensional structures and circuits

Sub-task

1.02 Modifies drawings and schematics.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

1.02.01	knowledge of modifications to electrical systems
1.02.02	knowledge of drawing conventions
1.02.03	knowledge of documentation requirements for drawings
1.02.04	knowledge of CAD systems
1.02.05	ability to prepare sketches
1.02.06	ability to document changes to drawings and schematics

Sub-task

1.03 Interprets service and operating manuals, specifications and technical bulletins.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

1.03.01	knowledge of operation of equipment or components
1.03.02	knowledge of service/operating manuals
1.03.03	knowledge of technical bulletins
1.03.04	knowledge of equipment specifications
1.03.05	ability to locate product information, operating service procedures and maintenance schedules
1.03.06	ability to access information from the Internet, DVD or CD

Supporting Knowledge & Abilities

1.03.07	ability to recognize need for and locate technical updates and technical bulletins
1.03.08	ability to update service operating manuals

Sub-task

1.04 Complies with government codes, standards and regulations.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

1.04.01	knowledge of government standards and regulations such as OHSA, WHMIS, TDG hazardous/dangerous goods
1.04.02	knowledge of ECUSR, IEEE, CSA, ULC and ISA standards
1.04.03	knowledge of Federal, Provincial and Municipal electrical codes
1.04.04	ability to locate and access standards, codes and regulations
1.04.05	ability to interpret standards, codes and regulations

Task 2 **Employs tools and equipment.**

Related Components: None.

Tools and Equipment: Screw drivers, side cutters, linesman pliers, needle nose pliers, files, slide lock pliers, crimping pliers, knives, wrenches, nut drivers, wire strippers, adjustable wrenches, socket set (metric/standard), feeler gauges, tape measures, hex keys (metric/standard), spline keys, hammers, chisels, fuse pullers, punch, taps, screw starters, hack saws, torque wrenches, hole saw, knock outs, fish tapes, pipe benders, drill bits, pullers, semi-con removers, eye bolts, belts, ropes, cabling, ladders, scaffolding, staging, hoists, tugging winches, cranes, blocks and tackle, jacks, come-alongs and conduit benders.

Sub-task

2.01 **Uses and services hand tools.**

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

2.01.01	knowledge of types and function of common hand tools
2.01.02	knowledge of metric and imperial tool sizes
2.01.03	knowledge of operating procedures and techniques for hand tools
2.01.04	ability to select hand tools required for task to be performed
2.01.05	ability to clean and lubricate hand tools
2.01.06	ability to store hand tools
2.01.07	ability to perform minor repairs such as sharpening, straightening and cleaning

Sub-task

2.02 Operates and services portable power tools.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

2.02.01 knowledge of types and functions of air, electric and hydraulic portable power tools

2.02.02 knowledge of operating procedures for air, electric and hydraulic portable power tools

2.02.03 knowledge of capabilities and limitations of air, electric and hydraulic portable power tools

2.02.04 knowledge of power supply requirements for selected portable power tools

2.02.05 ability to select the portable power tools for the job to be performed

2.02.06 ability to clean and lubricate portable power tools

2.02.07 ability to perform minor repairs such as replace power cord ends, replace air line connectors and replace hydraulic or air hoses

2.02.08 ability to store portable power tools

Sub-task

2.03 Operates powder-actuated tools.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

2.03.01 knowledge of types and functions of powder-actuated tools

2.03.02 knowledge of operating procedures for powder-actuated tools

2.03.03 knowledge of specifications of fasteners for powder-actuated tools

Supporting Knowledge & Abilities

2.03.04	knowledge of capabilities and limitations of powder-actuated tools
2.03.05	knowledge of licencing or training requirements prior to use of powder-actuated tools
2.03.06	ability to charge powder-actuated tools
2.03.07	ability to clean and lubricate powder-actuated tools
2.03.08	ability to perform basic maintenance and minor repairs of powder-actuated tools
2.03.09	ability to transport, store and dispose of powder-actuated tools

Sub-task

2.04 Operates and services stationary power tools.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

Supporting Knowledge & Abilities

2.04.01	knowledge of types and functions of stationary power tools
2.04.02	knowledge of operating procedures for stationary power tools
2.04.03	knowledge of capabilities and limitations of stationary power tools
2.04.04	knowledge of power supply requirements for selected stationary power tools
2.04.05	ability to select the stationary power tool for the job to be performed
2.04.06	ability to clean and lubricate stationary power tools
2.04.07	ability to perform minor repairs

Sub-task

2.05 Uses access equipment.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

2.05.01	knowledge of types of access equipment such as ladders, staging and scaffolding
2.05.02	knowledge of load bearing capacity of access equipment
2.05.03	knowledge of standards, specifications and regulations for access equipment such as Occupational Health and Safety Regulations
2.05.04	ability to secure access equipment
2.05.05	ability to employ fall arrest equipment such as harnesses, safety belts and lines
2.05.06	ability to erect, dismantle and maintain stationary scaffolding
2.05.07	ability to erect, dismantle and maintain rolling scaffolding
2.05.08	ability to erect, dismantle and maintain staging

Sub-task

2.06 Operates and maintains material handling equipment.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

2.06.01	knowledge of types and functions of hoisting, tugging and lifting devices such as jacks, hoists and come-alongs
2.06.02	knowledge of types and functions of rigging equipment such as belts, ropes, cables and slings
2.06.03	knowledge of operating procedures and techniques for hoisting, tugging and lifting devices

Supporting Knowledge & Abilities

2.06.04	knowledge of hoisting, tugging and lifting capacities
2.06.05	ability to calculate loads and weights
2.06.06	ability to clean, lubricate and store rigging, hoisting, tugging and lifting devices
2.06.07	ability to recognize damaged, worn, defective and leaking components
2.06.08	ability to perform minor repairs and replenish fluids

Sub-task

2.07 Uses mechanical measuring equipment.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

Supporting Knowledge & Abilities

2.07.01	knowledge of types and functions of mechanical measuring equipment such as vernier calipers, micrometers and dial indicators
2.07.02	knowledge of operating procedures for mechanical measuring equipment
2.07.03	knowledge of handling and storage requirements for mechanical measuring equipment
2.07.04	ability to check mechanical measuring equipment for accuracy and calibration
2.07.05	ability to convert between metric and imperial measurements
2.07.06	ability to identify damaged, worn or inaccurate mechanical measuring equipment
2.07.07	ability to store mechanical measuring equipment

Sub-task

2.08 Operates electrical testing and diagnostic tools.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

2.08.01	knowledge of types and functions of electrical testing and diagnostic tools
2.08.02	knowledge of proper care and handling of electrical testing and diagnostic tools
2.08.03	knowledge of operating procedures for electrical testing and diagnostic tools
2.08.04	knowledge of capabilities and limitations of electrical testing and diagnostic tools
2.08.05	ability to interpret readings and fault codes
2.08.06	ability to hook up electrical testing and diagnostic tools
2.08.07	ability to perform minor maintenance such as changing batteries or cleaning connectors
2.08.08	ability to store electrical testing and diagnostic tools

Sub-task

2.09 Operates computer systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

2.09.01	knowledge of types and functions of computer systems
2.09.02	knowledge of capabilities of computer systems
2.09.03	knowledge of computer operating systems and networking requirements
2.09.04	knowledge of computer system software such as word processors, data bases, e-mail and Internet browsers

Supporting Knowledge & Abilities

2.09.05	ability to download and upload e-mail and digital images on laptop and desk top computers
2.09.06	ability to backup storage media
2.09.07	ability to create and modify documents
2.09.08	ability to input data to manufacturer's software

Task 3 **Demonstrates work practices and procedures.**

Related Components: None.

Tools and Equipment: As per list of hand, power, hydraulic, hoisting, rigging, lifting, measuring, and diagnostic tools and equipment.

Sub-task

3.01 **Conducts work area inspection.**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

Supporting Knowledge & Abilities

3.01.01	knowledge of component defects
3.01.02	knowledge of inspection check lists
3.01.03	ability to recognize work area hazards
3.01.04	ability to recognize defective equipment and components
3.01.05	ability to recognize damaged or worn components
3.01.06	ability to document work area inspections

Sub-task

3.02 Installs fasteners, fittings and connectors.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

3.02.01 knowledge of types, styles, purposes and sizes of fasteners, fittings and connectors

3.02.02 knowledge of capabilities and limitation of fasteners, fittings and connectors

3.02.03 knowledge of replacement procedures and techniques for fasteners, fittings and connectors

3.02.04 knowledge of torque limits

3.02.05 knowledge of required lubricants and sealants on fittings, fasteners and connectors

3.02.06 ability to select fasteners, fittings and connectors compatible and reliable with job specifications

3.02.07 ability to torque fasteners

3.02.08 ability to lubricate and seal fasteners, fittings and connectors

Sub-task

3.03 Performs lock-out and tagging.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

3.03.01 knowledge of lock-out and tagging procedures and techniques

3.03.02 knowledge of system components that require lock-out and tagging

3.03.03 knowledge of plant and documentation requirements

3.03.04 ability to implement lock-out procedures

Supporting Knowledge & Abilities

3.03.05 ability to affix tags and signage

Sub-task

3.04 Installs conduit.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

Supporting Knowledge & Abilities

3.04.01 knowledge of types and sizes of conduit

3.04.02 knowledge of electrical applications requiring conduit

3.04.03 ability to route conduit

3.04.04 ability to mount and secure conduit

3.04.05 ability to cut and join conduit

3.04.06 ability to bend conduit

Sub-task

3.05 Performs electrical wiring and termination operations.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

Supporting Knowledge & Abilities

3.05.01 knowledge of types, sizes and gauges of wire

3.05.02 knowledge of wiring procedures and techniques

3.05.03 knowledge of termination procedures and techniques

3.05.04 ability to route and secure wiring

3.05.05 ability to cut and crimp wiring

3.05.06 ability to label, verify and record installation of wiring

3.05.07 ability to check continuity of wiring

Supporting Knowledge & Abilities

3.05.08 ability to terminate wiring

3.05.09 ability to fish wiring through conduit

Sub-task

3.06 Installs raceways, cable trays, busways and associated components.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

3.06.01 knowledge of types and sizes of raceways, cable trays, busways and associated components

3.06.02 knowledge of electrical codes and local utility standards

3.06.03 knowledge of methods of support for raceways, cable trays and busways

3.06.04 knowledge of grounding techniques and procedures for raceways, cable trays and busways

3.06.05 ability to layout position of raceways, cable trays and busways

3.06.06 ability to secure raceways, cable trays and busways

Sub-task

3.07 Cleans and lubricates parts and components.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

3.07.01 knowledge of cleaning equipment

3.07.02 knowledge of lubricating equipment

Supporting Knowledge &Abilities

3.07.03	knowledge of characteristics, applications, qualities and capabilities of lubricants and cleaners
3.07.04	knowledge of cleaning and lubricating equipment operating procedures and techniques
3.07.05	knowledge of personal and work area protective equipment
3.07.06	knowledge of ventilation requirements
3.07.07	knowledge of environmental protection requirements for cleaners and lubricants such as recovery, disposal, storage and handling
3.07.08	ability to apply lubricants
3.07.09	ability to operate cleaning equipment

Sub-task

3.08 Troubleshoots common electrical devices associated with pneumatic/hydraulic/ mechanical systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

3.08.01	knowledge of components of electrical devices associated with pneumatic/hydraulic systems such as central system pressure switches
3.08.02	knowledge of operation of electrical devices associated with pneumatic/hydraulic systems
3.08.03	knowledge of operation of pneumatic/hydraulic systems
3.08.04	knowledge of diagnostic instruments such as regulators and pressure gauges
3.08.05	knowledge of faults that occur in electrical devices associated with pneumatic/hydraulic systems

Supporting Knowledge & Abilities

3.08.06	knowledge of service procedures and techniques for pneumatic/hydraulic systems
3.08.07	ability to shutdown pneumatic/hydraulic systems
3.08.08	ability to operate diagnostic instruments
3.08.09	ability to isolate fault to electrical devices in pneumatic/hydraulic systems
3.08.10	ability to replace filters, air dryers and oil injectors on pneumatic systems
3.08.11	ability to operate portable hydraulic units and set pressure rise and fall on pressure switches

Sub-task

3.09 Services mechanical components of electrical equipment.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

3.09.01	knowledge of mechanical components associated with electrical equipment such as chains, sprockets, belts, links, levels, pulleys, sockets, couplings, shafts, bearings and bushings
3.09.02	knowledge of operation of mechanical components
3.09.03	knowledge of replacement and adjustment procedures for mechanical components
3.09.04	ability to replace defective, damaged or worn mechanical components
3.09.05	ability to align mechanical components
3.09.06	ability to adjust mechanical components such as links, levels and belts

Sub-task

3.10 Completes work-related documentation.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

3.10.01 knowledge of required work-related documents such as repair orders, maintenance cards/sheets, preventative/predictive maintenance sheets and government inspection forms

3.10.02 knowledge of information required for specific work-related documents such as work performed, date performed, signature, time required and parts replaced

3.10.03 ability to file service records

3.10.04 ability to update service records

BLOCK B

WIRING AND LIGHTING SYSTEMS

Trends: *The trend is towards high pressure sodium outdoors, metal halide indoors, use of photocells in outdoor lighting, use of dual filament lamps and energy efficient/solid state ballasts. Also towards improved grounding requirements/fault carrying capabilities. Moving away from CAD-weld and towards mechanical compression fittings.*

Task 4 Installs and maintains illumination systems.

Related Components: Panels, contactors, lighting fixtures, ballasts, bulbs, switches, photo cells, timers, wires, infrared detectors, capacitors or starters.

Tools and Equipment: Common hand tools, light fixture testers, bulb extractors, lumin meter, ladders, extension sticks and man lift systems.

Sub-task

4.01 Inspects illumination systems. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

4.01.01	knowledge of components of illumination systems
4.01.02	knowledge of operation of components of illumination systems
4.01.03	knowledge of inspection techniques
4.01.04	ability to recognize damaged, worn, defective or hazardous components such as cracked lens, missing globes/guards, flickering lamps, broken sockets or broken/missing supports
4.01.05	ability to recognize abnormal odours and sounds such as humming
4.01.06	ability to functionally test illumination systems

Sub-task

4.02 Replaces illumination systems. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

4.02.01	knowledge of installation techniques and applications for illumination systems
4.02.02	knowledge of types and sizes of luminaires
4.02.03	ability to mount and secure components
4.02.04	ability to connect components

Sub-task

4.03 Troubleshoots illumination systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

4.03.01	knowledge of illumination systems
4.03.02	knowledge of types and sizes of luminaires
4.03.03	knowledge of capability and capacity of system parts such as ballasts and lamps
4.03.04	knowledge of faults in illumination systems such as shorts and grounds
4.03.05	ability to employ diagnostic equipment such as multi-meters and lamp testers
4.03.06	ability to recognize faults in illumination systems
4.03.07	ability to isolate faults in illumination systems down to part/component

Sub-task

4.04 Repairs illumination systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

4.04.01	knowledge of procedures and techniques and performance characteristics of illumination systems
4.04.02	knowledge of repair, replacement, adjustment procedures and techniques for illumination systems
4.04.03	knowledge of types, sizes, ratings and operation of components/parts such as photo cells and timers

Supporting Knowledge & Abilities

4.04.04	ability to replace illumination system components/parts such as ballasts, sockets and lamps
4.04.05	ability to adjust height and angles of fixtures
4.04.06	ability to verify operation of adjusted and replaced components/parts

Task 5 **Maintains single and three-phase AC systems.**

Related Components: Chargers, breakers, panels, transformers, rectifiers, generators, contactors, relays, metering/protection conditioning devices, cables/wires, cable trays.

Tools and Equipment: Common hand tools and load testers.

Sub-task

5.01 **Inspects single and three-phase AC systems.**

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

5.01.01	knowledge of components of single and three-phase AC systems
5.01.02	knowledge of operational characteristics of single and three-phase AC systems
5.01.03	knowledge of inspection procedures
5.01.04	ability to recognize damaged, worn, defective, hazardous components such as damaged insulation, sockets, ballasts and chargers
5.01.05	ability to conduct physical examination for abnormal characteristics such as heat
5.01.06	ability to verify operation of systems

Sub-task

5.02 Replaces single and three-phase AC systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

5.02.01	knowledge of installation procedures and techniques for single and three-phase AC systems
5.02.02	knowledge of operational characteristics such as heat ratings, types and uses
5.02.03	ability to mount and secure components such as panels, switches, relays and breakers
5.02.04	ability to connect components

Sub-task

5.03 Troubleshoots single and three-phase AC systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

5.03.01	knowledge of operational characteristics of single and three-phase AC systems such as capabilities of components, balance loads, voltage ratings and frequencies
5.03.02	knowledge of probable causes of faults such as shorts, opens and grounds
5.03.03	knowledge of fault severity
5.03.04	ability to operate diagnostic equipment such as meters and ballast testers
5.03.05	ability to isolate fault to a component or part
5.03.06	ability to interpret diagnostic data

Sub-task

5.04 Repairs single and three-phase AC systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

5.04.01	knowledge of replacement procedures and techniques
5.04.02	knowledge of adjustment procedures, ratings and properties
5.04.03	knowledge of types, sizes, capabilities of components
5.04.04	knowledge of operation of the components
5.04.05	ability to replace components such as relays, contactors, transformers and sockets
5.04.06	ability to bring components into specification such as adjusting spring tension on relays, gap between contacts and transformer outputs
5.04.07	ability to fabricate or modify replacement components such as shades, guards, relay mountings, back planes and panels
5.04.08	ability to verify operation of replaced, adjusted and fabricated components

Sub-task

5.05 Services single and three-phase AC systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

5.05.01	knowledge of operational characteristics of components such as life expectancy
5.05.02	knowledge of procedures and techniques for servicing, preventative/predictive maintenance, routing and frequency

Supporting Knowledge & Abilities

5.05.03 ability to perform preventative/predictive maintenance procedures

5.05.04 ability to verify operation of components

Task 6 Maintains DC systems.

Related Components: Chargers, breakers, panels, transformers, rectifiers, generators, contactors, relays, metering/protection conditioning devices, cables/wires, cable trays.

Tools and Equipment: Common hand tools, battery maintenance kit, load testers, hydrometers.

Sub-task

6.01 Inspects DC systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

6.01.01 knowledge of components of DC systems

6.01.02 knowledge of operational characteristics of DC systems

6.01.03 knowledge of inspection procedures

6.01.04 ability to recognize damaged, worn, defective, hazardous components such as damaged insulation, sockets, ballasts, chargers and batteries

6.01.05 ability to conduct physical examination for abnormal characteristics such as heat

6.01.06 ability to verify operation of systems

Sub-task

6.02 Replaces DC systems.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

Supporting Knowledge & Abilities

6.02.01 knowledge of installation procedures and techniques for DC systems

6.02.02 knowledge of operational characteristics such as heat ratings, types and uses

6.02.03 ability to mount and secure components such as panels, switches, relays and breakers

6.02.04 ability to connect components

Sub-task

6.03 Troubleshoots DC systems.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

Supporting Knowledge & Abilities

6.03.01 knowledge of operational characteristics of DC systems such as capabilities of components, balance loads, voltage ratings

6.03.02 knowledge of probable causes of faults such as shorts, opens and grounds

6.03.03 knowledge of fault severity

6.03.04 ability to operate diagnostic equipment such as meters and ballast testers

6.03.05 ability to isolate fault to a component or part

6.03.06 ability to interpret diagnostic data

Sub-task

6.04 Repairs DC systems.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

Supporting Knowledge & Abilities

6.04.01	knowledge of replacement procedures and techniques
6.04.02	knowledge of adjustment procedures, ratings and properties
6.04.03	knowledge of types, sizes, capabilities of components
6.04.04	knowledge of operation of the components
6.04.05	ability to replace components such as relays, contactors and sockets
6.04.06	ability to bring components into specification such as adjusting spring tension on relays and gap between contacts
6.04.07	ability to fabricate or modify replacement components such as shades, guards, relay mountings, back planes and panels
6.04.08	ability to verify operation of replaced, adjusted and fabricated components

Sub-task

6.05 Services DC systems.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

Supporting Knowledge & Abilities

6.05.01	knowledge of operational characteristics of components such as life expectancy
6.05.02	knowledge of procedures and techniques for servicing preventative/predictive maintenance, routing and frequency
6.05.03	ability to perform preventative/predictive maintenance procedures

Supporting Knowledge & Abilities

6.05.04 ability to verify operation of components

Task 7 **Maintains grounding, bonding and cathodic protection systems.**

Related Components: Ground rods, wires, ground clamps, safety mats, compression fittings, connectors, fasteners and ground mounting devices.

Tools and Equipment: Common hand tools, hot sticks, crimping tools, thermit-welding such as CAD-weld equipment and hot gloves.

Sub-task

7.01 Inspects grounding, bonding and cathodic protection systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

7.01.01 knowledge of inspection procedures and techniques

7.01.02 knowledge of system components and characteristics such as types, sizes and uses

7.01.03 knowledge of system requirements such as fault current

7.01.04 ability to visually and physically examine components for wear, damages and defects

Sub-task

7.02 Replaces grounding, bonding and cathodic protection systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

7.02.01 knowledge of installation techniques and procedures such as torque requirements

Supporting Knowledge & Abilities

7.02.02	knowledge of system characteristics such as types, sizes, interchangeability and location
7.02.03	knowledge of requirements of the grounding, bonding, cathodic system such as fault protocol and ground conditions
7.02.04	ability to use specialty tools such as powder-actuated tools
7.02.05	ability to mount and secure components such as conductors, neutral grounding and current transformers
7.02.06	ability to connect/attach components such as ground clamps and thermit-welding equipment

Sub-task

7.03 Troubleshoots grounding, bonding and cathodic protection systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

7.03.01	knowledge of system characteristics
7.03.02	knowledge of probable causes of faults
7.03.03	knowledge of required diagnostic equipment such as meggers, meters and grounding test sets
7.03.04	ability to analyze component faults
7.03.05	ability to operate diagnostic equipment
7.03.06	ability to interpret diagnostic results

Sub-task

7.04 Repairs grounding, bonding and cathodic protection systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

7.04.01	knowledge of replacement procedures and techniques
7.04.02	knowledge of adjustment procedures and techniques
7.04.03	knowledge of system characteristics
7.04.04	knowledge of specialty equipment types, uses and procedures
7.04.05	ability to replace damaged components
7.04.06	ability to adjust tolerances of components to specifications
7.04.07	ability to use specialty equipment such as powder-actuated tools
7.04.08	ability to verify operation of replaced components
7.04.09	ability to verify system integrity

Sub-task

7.05 Services grounding, bonding and cathodic protection systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

7.05.01	knowledge of system requirements and characteristics
7.05.02	knowledge of test procedures and techniques
7.05.03	knowledge of preventative maintenance schedule such as frequency and routing

Supporting Knowledge & Abilities

7.05.04	knowledge of components and parts
7.05.05	ability to functionally test systems
7.05.06	ability to perform preventative maintenance procedures
7.05.07	ability to verify operation of systems

Task 8 **Maintains seismic restraint systems.**

Related Components: Anchor bolts, cables, cantruss springs, mounting pads, cable clamps.

Tools and Equipment: Common hand tools, drills and ladders.

Sub-task

8.01 **Inspects seismic restraint systems.**

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	no	no	no	yes	yes	yes	yes	yes	ND	yes	NV

8.01.01	knowledge of government requirements (as applicable to geographic location)
8.01.02	knowledge of inspection procedures and techniques of systems
8.01.03	knowledge of system components such as cables and vibration mounts
8.01.04	ability to visually and physically examine systems for system integrity

Sub-task

8.02 Replaces seismic restraint systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	no	no	no	yes	yes	yes	yes	yes	ND	yes	NV

8.02.01 knowledge of installation procedures and techniques

8.02.02 knowledge of specifications of components such as cable sizes, types and mounting hardware

8.02.03 knowledge of fabrication techniques

8.02.04 ability to mount and secure components such as cables and mounting hardware

8.02.05 ability to connect components such as cables and mounting hardware

8.02.06 ability to fabricate mounting components

Sub-task

8.03 Repairs seismic restraint systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	no	no	no	yes	yes	yes	yes	yes	ND	yes	NV

8.03.01 knowledge of replacement procedures and techniques

8.03.02 ability to replace cables and mounting hardware

8.03.03 ability to verify integrity of replaced components

BLOCK C

POWER DISTRIBUTION AND GENERATING SYSTEMS

Trends: *Trend is toward environmentally conscious production and distribution, energy management efficiency, networking of assets and sharing of information for efficiency, automation of power distribution and generating systems and deregulation of distributed generation.*

Task 9 **Maintains high voltage power distribution systems.**

Related Components: Generators, transformers, alternators, bus systems, switch gears, breakers, arresters, switches, capacitors, reactors, insulators, connectors.

Tools and Equipment: Common hand tools, test equipment, hot gloves, solvent guns, hot sticks, hot mats, grounding and bonding equipment.

Sub-task

9.01 **Inspects high voltage power systems.**

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
no	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

9.01.01 knowledge of components of system such as alternators, transformers and switch gears

9.01.02 knowledge of operation of components of high voltage power systems

9.01.03 knowledge of inspection procedures and techniques for high voltage power systems

9.01.04 knowledge of safety procedures and equipment required to inspect high voltage power systems

9.01.05 ability to visually examine high voltage systems for abnormal operation of components such as knife blades, alignment, damaged components and leaking transformers

9.01.06 ability to confirm operation of high voltage power systems

Sub-task

9.02 Replaces high voltage power systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
no	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

9.02.01	knowledge of operation of high voltage power systems and components
9.02.02	knowledge of installation procedures and techniques for termination of high voltage wires
9.02.03	knowledge of ratings and interchangeability of components such as bus and breakers
9.02.04	knowledge of high voltage test equipment and procedures
9.02.05	knowledge of safety procedures and equipment required to install high voltage power systems
9.02.06	ability to locate, mount and secure high voltage components such as transformers and disconnects
9.02.07	ability to terminate high voltage conductors
9.02.08	ability to operate high voltage test equipment
9.02.09	ability to interpret test data such as voltage, current, resistance, phase angle and frequency

Sub-task

9.03 Troubleshoots high voltage power systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
no	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

9.03.01	knowledge of operation of components of high voltage power systems such as alternators, transformers and switch gears
9.03.02	knowledge of high voltage diagnostic equipment and procedures

Supporting Knowledge & Abilities

9.03.03	knowledge of causes of power losses such as phase-to-phase shorts, over current and under-frequency
9.03.04	knowledge of safety procedures and equipment required to troubleshoot high voltage power sytems
9.03.05	ability to isolate faults to component levels
9.03.06	ability to operate diagnostic equipment
9.03.07	ability to interpret diagnostic data such as voltage, current and frequency

Sub-task

9.04 Repairs high voltage power systems.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
no	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

Supporting Knowledge & Abilities

9.04.01	knowledge of operation of high voltage power systems
9.04.02	knowledge of components of high voltage power systems
9.04.03	knowledge of repair, replacement and adjustment procedures and techniques for high voltage power components
9.04.04	knowledge of high voltage test equipment
9.04.05	knowledge of high voltage power systems components/parts such as transformers, connectors and switches
9.04.06	knowledge of operation of test equipment and interpret test data
9.04.07	knowledge of safety procedures and equipment required to repair high voltage power systems
9.04.08	ability to verify operation of replaced or adjusted components.

Sub-task

9.05 Services high voltage power systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
no	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

9.05.01	knowledge of operation of high voltage power systems
9.05.02	knowledge of components of high voltage power systems
9.05.03	knowledge of procedures and techniques for servicing high voltage insulation testing such as transformers, oil samplings, infra red analysis
9.05.04	knowledge of preventative/predictive maintenance schedule
9.05.05	knowledge of calibration procedures and techniques for components such as breakers, relays and switch gears
9.05.06	knowledge of operation of test equipment cleaning methods and materials for high voltage system components
9.05.07	knowledge of safety procedures and equipment required to service high voltage power systems
9.05.08	ability to calibrate components such as breakers, relays and switch gears
9.05.09	ability to perform procedures such as oil samplings, infra red testing and high voltage insulation testing
9.05.10	ability to clean components such as insulators, contactors and switch gears

Task 10 **Maintains low voltage power distribution systems.**

Related Components: Generators, transformers, alternators, bus systems, switch gears, breakers, arresters, switches, capacitors, reactors, insulators, connectors and cables.

Tools and Equipment: Common hand tools, test equipment, hot gloves and solvent guns.

Sub-task

10.01 Inspects low voltage power systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

10.01.01 knowledge of components of low voltage power systems such as alternators, transformers, switch gears and contactors

10.01.02 knowledge of operation of components of low voltage power systems

10.01.03 knowledge of inspection procedures and techniques for low voltage power systems

10.01.04 ability to visually examine low voltage systems for abnormal operation of components such as damaged components, leaking transformers and discolouration of contacts

10.01.05 ability to confirm operation of low voltage power systems

Sub-task

10.02 Installs low voltage power systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

10.02.01 knowledge of installation procedures and techniques for low voltage power systems such as generators, motor circuits, wire terminations

Supporting Knowledge & Abilities

10.02.02	knowledge of rating and interchangeability of components such as bus, breakers and distribution panels
10.02.03	knowledge of low voltage test equipment and procedures
10.02.04	knowledge of characteristics, types and sizes of low voltage power system components
10.02.05	ability to mount and secure low voltage components such as motors, generators and lights
10.02.06	ability to interpret test data
10.02.07	ability to connect power supply
10.02.08	ability to verify operation of low voltage power systems

Sub-task

10.03 Troubleshoots energized and non-energized low voltage power systems.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

Supporting Knowledge & Abilities

10.03.01	knowledge of operation and function of components of low voltage power systems such as motors, generators and switches
10.03.02	knowledge of low voltage diagnostic equipment and procedures
10.03.03	knowledge of fault characteristics of low voltage power systems
10.03.04	knowledge of types of tests for low voltage power systems
10.03.05	ability to operate diagnostic equipment such as meggers

Supporting Knowledge & Abilities

10.03.06 ability to interpret test data such as resistance level

10.03.07 ability to isolate faults to component levels

Sub-task

10.04 Repairs low voltage power systems.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

Supporting Knowledge & Abilities

10.04.01 knowledge of operation and function of components of low voltage power systems such as motors, generators and switches

10.04.02 knowledge of low voltage test equipment and procedures

10.04.03 knowledge of repair, replacement, alignment, adjustment, modification, procedures and techniques for low voltage power systems

10.04.04 ability to replace, adjust and modify low voltage power system components such as breakers, panels and motor control centres

10.04.05 ability to operate test equipment

10.04.06 ability to interpret test data

10.04.07 ability to verify operation of replaced, adjusted and modified low voltage power system components

10.04.08 ability to overhaul components such as motors, breakers and contactors

Sub-task

10.05 Services low voltage power systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

10.05.01	knowledge of components and characteristics of low voltage power systems
10.05.02	knowledge of procedures and techniques for servicing components such as bearings, contacts, relays and switches
10.05.03	knowledge of specifications of components of low voltage power systems
10.05.04	knowledge of preventative/predictive maintenance schedule
10.05.05	knowledge of calibration procedures and techniques
10.05.06	knowledge of operation of test equipment
10.05.07	ability to perform procedures such as greasing, cleaning, retorquing and painting
10.05.08	ability to operate test equipment
10.05.09	ability to interpret test data
10.05.10	ability to verify operation of low voltage power system components to specification

Task 11 Maintains direct current power systems.

Related Components: Generators, cables/wires, protection devices, metering disconnect, batteries, bus bars, collector shoes, brushes, panels and breakers.

Tools and Equipment: Common hand tools and hot gloves.

Sub-task

11.01 Inspects direct current power systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

11.01.01 knowledge of operation of direct current power systems

11.01.02 knowledge of components of direct current power systems

11.01.03 knowledge of inspection procedures and techniques for direct current power systems

11.01.04 knowledge of specifications of components of direct current power systems

11.01.05 ability to visually examine direct current power system components such as motors, generators, batteries and brushes

11.01.06 ability to confirm operation of DC power system components

Sub-task

11.02 Replaces direct current power systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

11.02.01 knowledge of installation procedures and techniques for DC power system components

11.02.02 knowledge of specifications, interchangeability, and characteristics of components such as contactors, breakers and relays

11.02.03 knowledge of test equipment

11.02.04 ability to operate test equipment

11.02.05 ability to interpret test data

Supporting Knowledge & Abilities

11.02.06	ability to locate, mount and secure components of DC power systems
11.02.07	ability to terminate DC component connections
11.02.08	ability to verify operation of DC power systems

Sub-task

11.03 Troubleshoots direct current power systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

11.03.01	knowledge of operation of components of DC power systems such as motors and generators
11.03.02	knowledge of diagnostic equipment and procedures
11.03.03	knowledge of types and characteristics of DC power system components such as field control/systems and batteries
11.03.04	knowledge of types and causes of failure of DC power system components
11.03.05	ability to operate diagnostic equipment
11.03.06	ability to interpret diagnostic data such as voltage and current resistance
11.03.07	ability to locate and isolate faulty components in DC power systems

Sub-task

11.04 Repairs direct current power systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

11.04.01	knowledge of operation of DC power systems

Supporting Knowledge & Abilities

11.04.02	knowledge of components of DC power systems
11.04.03	knowledge of specifications and characteristics of components of DC power systems
11.04.04	knowledge of test equipment and procedures
11.04.05	knowledge of capacities and interchangeability of components such as brushes, relays and buses
11.04.06	knowledge of procedures and techniques for repair, replacement, adjustment, modification and fabrication of components for DC power systems
11.04.07	ability to operate test equipment
11.04.08	ability to interpret test data
11.04.09	ability to replace, adjust, and modify components for DC power systems
11.04.10	ability to verify operation of replaced, adjusted and modified components for DC power systems

Sub-task

11.05 Services direct current power systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

11.05.01	knowledge of operation of DC power systems
11.05.02	knowledge of characteristics and specifications for components of DC power systems
11.05.03	knowledge of procedures and techniques for servicing such as replacing brushes, batteries and bearings and resurfacing commutators
11.05.04	knowledge of preventative/predictive maintenance schedule

Supporting Knowledge & Abilities

11.05.05	knowledge of calibration procedures and techniques for components such as brushes, spring tension and contact/pressure gap
11.05.06	knowledge of operation of test equipment and procedures for testing
11.05.07	ability to operate test equipment
11.05.08	ability to interpret test data such as resistance integrity, voltage and current
11.05.09	ability to calibrate components such as electrolyte levels, brush gap, spring tension and charger
11.05.10	ability to perform procedures such as cleaning, painting and resurfacing

BLOCK D

ELECTRICAL EQUIPMENT

Trends: *Higher efficiency motors, higher isolation voltages for use with variable frequency drives (VFD), and microprocessor driven controls with higher accuracy drives. More user friendly interfaces. Drives are more affordable from cost/benefit perspective. Drives more compact, broader range of drive sizes.*

Task 12 **Maintains rotating equipment and associated controls.**

Related Components: DC and AC motors, generators, alternators, eddy current brakes/clutches, friction brakes/clutches, disconnects, voltage regulators, centrifugal switches, governors, start/stop stations, human machine interface and synchronizer.

Tools and Equipment: Common hand tools, pullers, meggers, ammeters, tachometers, undercutting and resurfacing tools, Wheatstone bridges, air blowers, brush seating stones and hand scales.

Sub-task

12.01 Inspects rotating equipment and associated controls.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

12.01.01	knowledge of components of rotating equipment and associated controls
12.01.02	knowledge of operation of components
12.01.03	knowledge of inspection techniques and procedures
12.01.04	ability to recognize damaged, worn, defective or hazardous components such as bearings, brushes and slip rings
12.01.05	ability to recognize abnormal heat, sounds, odours, vibrations and arching/sparking sources
12.01.06	ability to functionally test control elements such as Human Machine Interface (HMI), starting/stopping systems and speed controls

Sub-task

12.02 Replaces rotating equipment and associated controls.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

12.02.01	knowledge of installation procedures and techniques
12.02.02	knowledge of types, sizes and ratings of parts and components
12.02.03	ability to mount and secure rotating equipment and associated controls
12.02.04	ability to connect rotating equipment and associated controls to power source

Supporting Knowledge & Abilities

12.02.05 ability to verify operation of installed rotating equipment

Sub-task

12.03 Troubleshoots rotating equipment and associated controls.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

12.03.01 knowledge of rotating equipment and associated control systems

12.03.02 knowledge of types, sizes and ratings of system components such as AC/DC motors, AC/DC generators and HMI's

12.03.03 knowledge of faults in rotating equipment and associated controls such as shorts, grounds and loss of phase

12.03.04 ability to employ diagnostic equipment such as multi-meters, meggers and tachometers

12.03.05 ability to recognize faults

12.03.06 ability to isolate faults in system down to parts/components

Sub-task

12.04 Repairs rotating equipment and associated controls.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

12.04.01 knowledge of repair, replacement, adjustment techniques and procedures

12.04.02 knowledge of types, sizes, ratings and operation of components/parts

Supporting Knowledge & Abilities

12.04.03	ability to replace components/parts such as brushes, bearings, thermistors and HMI's
12.04.04	ability to adjust control parameters such as speed, acceleration and overload settings
12.04.05	ability to verify operation of repaired, replaced or adjusted components/parts

Sub-task

12.05 Services rotating equipment and associated controls.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

12.05.01	knowledge of procedures and techniques for servicing rotating equipment and associated controls
12.05.02	knowledge of types and ratings of components/parts
12.05.03	knowledge of calibration procedures and techniques
12.05.04	knowledge of calibration equipment
12.05.05	knowledge of preventive/predictive maintenance procedures and techniques
12.05.06	ability to employ calibration equipment
12.05.07	ability to apply preventive maintenance procedures such as scheduled brush replacement, resurface commutator and remove obstructions and debris
12.05.08	ability to remove obstruction and debris from cooling surfaces

Task 13 **Maintains drives and associated controls.**

Related Components: HMI modules, printed circuit boards such as IO interface boards, firing boards, communication boards, mother boards, rectifiers, DC power supply, LCD panels, cooling fans, thyristor switches, heat sinks, filtering circuits.

Tools and Equipment: Common hand tools, static proof dust cleaners, computer software, multi-meters, ammeters, (hall effect or analogue) oscilloscopes, GTO clamps, (gate turn on), chart recorders, ground straps (static), manufacturers special service tools and heat sink compound.

Sub-task

13.01 Inspects drives and associated controls.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

13.01.01 knowledge of drives and associated control systems

13.01.02 knowledge of operation of components

13.01.03 knowledge of inspection techniques and procedures

13.01.04 knowledge of operating parameters of drive system and associated controls

13.01.05 ability to confirm performance within parameters such as deceleration, loading and acceleration

13.01.06 ability to functionally test drives and associated control elements such as HMI, starting and stopping systems and speed controls

Sub-task

13.02 Replaces drives and associated controls.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

Supporting Knowledge & Abilities

13.02.01	knowledge of installation procedures and techniques
13.02.02	knowledge of types, sizes, ratings of parts and components
13.02.03	ability to mount and secure drives and associated controls
13.02.04	ability to connect drives and associated controls to power source
13.02.05	ability to configure operating parameters
13.02.06	ability to verify operation of installed drives and associated controls
13.02.07	ability to tune for optimal performance

Sub-task

13.03 Troubleshoots drives and associated controls.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

Supporting Knowledge & Abilities

13.03.01	knowledge of drives and associated control system
13.03.02	knowledge of types, sizes, rating of system components/parts such as HMI, modules, filters and power supplies
13.03.03	knowledge of operating parameters of system
13.03.04	knowledge of faults such as shorts, grounds, misfires and communication loss

Supporting Knowledge & Abilities

13.03.05 ability to employ diagnostic equipment such as multi-meters, tachometers, HMI and oscilloscopes

13.03.06 ability to recognize faults

13.03.07 ability to isolate faults in system to parts/components to card level

Sub-task

13.04 Repairs drives and associated controls.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

13.04.01 knowledge of repair, replacement, tuning techniques and procedures

13.04.02 knowledge of types, size, rating and operation of components/parts

13.04.03 ability to replace components such as boards, thyristors, heat sinks and printed circuits

13.04.04 ability to tune control loops and drive parameters such as acceleration, deceleration and overloads

13.04.05 ability to verify operation of replaced and tuned components/parts

Sub-task

13.05 Services drives and associated controls.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

13.05.01 knowledge of procedures and techniques for servicing drives and associated controls

Supporting Knowledge & Abilities

13.05.02	knowledge of types and ratings of components/parts
13.05.03	knowledge of tuning procedures and techniques
13.05.04	knowledge of operating parameter for drives and associated control systems
13.05.05	knowledge of tuning equipment such as field remotes, interface units, oscilloscopes, HMI and tachometers
13.05.06	ability to employ tuning equipment
13.05.07	ability to tune to optimal performance levels
13.05.08	ability to tighten connections
13.05.09	ability to disassemble/reassemble drive components/parts
13.05.10	ability to remove obstruction and debris from cooling fan surfaces

BLOCK E

EMERGENCY AND STANDBY SYSTEMS

Trends: *More extensive use of standby systems. Increased requirements for standby systems. Increased reliability of standby systems.*

Task 14 **Maintains uninterruptible power supply systems (UPS).**

Related Components: Battery type UPS, batteries, contactors, automatic and manual static switches, inverters, rotating type UPS motors, generators, fly wheels and transfer switches.

Tools and Equipment: Common hand tools, battery maintenance kit, aprons, gloves, face shields, air sampling equipment and oscilloscopes.

Sub-task

14.01 Inspects uninterruptible power supply systems (UPS).

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

14.01.01	knowledge of components of UPS
14.01.02	knowledge of operation of UPS
14.01.03	knowledge of inspection techniques and procedures
14.01.04	ability to recognize hazardous conditions in batteries and chargers
14.01.05	ability to interpret monitor readings such as battery voltage, charge rate and ambient temperature

Sub-task

14.02 Replaces uninterruptible power supply systems (UPS).

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

14.02.01	knowledge of installation procedures and techniques
14.02.02	knowledge of types, sizes, ratings, capacity and manufacturer's recommendations of UPS components such as batteries and inertia
14.02.03	ability to recognize battery hazards and ventilation requirements
14.02.04	ability to mount and secure UPS
14.02.05	ability to connect UPS to power source and protected load
14.02.06	ability to verify operation of installed UPS

Sub-task

14.03 Troubleshoots uninterruptible power supply systems (UPS).

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

14.03.01	knowledge of UPS equipment
14.03.02	knowledge of types, sizes, ratings and capacity of UPS
14.03.03	knowledge of faults such as low battery voltage, low electrolyte levels, incorrect charging rates and switching controls
14.03.04	knowledge of diagnostic equipment such as battery test kit, oscilloscopes and multi-meters
14.03.05	ability to employ diagnostic equipment
14.03.06	ability to recognize faults
14.03.07	ability to isolate system faults to parts/components

Sub-task

14.04 Repairs uninterruptible power supply systems (UPS).

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

14.04.01	knowledge of repair and replacement techniques and procedures
14.04.02	knowledge of types, sizes, rating and operation of components/parts
14.04.03	ability to replace components such as fuses, batteries, rectifiers and thyristors
14.04.04	ability to verify operation of replaced components/parts

Sub-task

14.05 Services uninterruptible power supply systems (UPS).

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

14.05.01	knowledge of procedures and techniques for servicing UPS
14.05.02	knowledge of types, sizes and ratings of components/parts
14.05.03	knowledge of calibration procedures and techniques
14.05.04	knowledge of equipment such as hygrometers, multi-meters and volume sensors
14.05.05	knowledge of battery replacement schedule
14.05.06	ability to employ test equipment
14.05.07	ability to replace batteries
14.05.08	ability to correct electrolyte levels
14.05.09	ability to clean and tighten battery connections

Task 15 Maintains standby power generating systems.

Related Components: Diesel, gasoline, steam, sea water (tides), natural gas powered engines or prime movers, generators, alternators, converters, transfer switches, batteries, power cells, solar cells, inverters and wind turbines.

Tools and Equipment: Common hand tools, battery maintenance kit, oscilloscopes, frequency meters and tachometers.

Sub-task

15.01 Inspects standby power generating systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

15.01.01 knowledge of components of standby power generating systems

15.01.02 knowledge of operation of standby power generating systems

15.01.03 knowledge of inspection techniques and procedures

15.01.04 ability to recognize damaged, worn, defective or hazardous components such as bearings, brushes and slip rings

15.01.05 ability to recognize abnormal heat, sounds, odours, vibration, arcing and sparking

15.01.06 ability to functionally test system and components such as transfer switches and battery chargers

Sub-task

15.02 Replaces standby power generating systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

15.02.01 knowledge of installation procedures and techniques

15.02.02 knowledge of types, sizes and rating of systems

15.02.03 ability to mount and secure standby power generating systems

15.02.04 ability to connect standby power generating systems to power supply and protected load

15.02.05 ability to verify operation of installed standby systems

Sub-task

15.03 Troubleshoots standby power generating systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

15.03.01	knowledge of diagnostic techniques and procedures
15.03.02	knowledge of standby power generating systems
15.03.03	knowledge of types and ratings of system components/parts
15.03.04	knowledge of faults in standby power generating systems such as shorts, ground, loss of field and failure to start
15.03.05	ability to employ diagnostic equipment such as multi-meters, oscilloscopes, tachometers and meggers
15.03.06	ability to recognize faults
15.03.07	ability to isolate system faults down to components/parts

Sub-task

15.04 Repairs standby power generating systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

15.04.01	knowledge of repair, replacement and adjustment techniques and procedures
15.04.02	knowledge of types, sizes, ratings and operation of system components/parts
15.04.03	ability to replace components/parts such as brushes, batteries and transfer switch parts
15.04.04	ability to adjust control parameters such as speed, synchronization and droop

Supporting Knowledge & Abilities

15.04.05 ability to verify operation of repaired, replaced or adjusted components/parts

Sub-task

15.05 Services standby power generating systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

15.05.01 knowledge of procedures and techniques for servicing standby power generating systems

15.05.02 knowledge of types and ratings of components/parts

15.05.03 ability to employ monitoring devices such as voltmeters, ammeters and synchrometers

15.05.04 ability to test functionality of system and peripherals such as dampers

15.05.05 ability to complete service checklists

15.05.06 ability to apply preventive, predictive maintenance procedures such as check fluid levels and tighten connections

BLOCK F

COMMUNICATION SYSTEMS

Trends: *Trend toward lower cost, higher reliability of communication systems and components. Replacement preferred to repair components of communication systems. Maintenance and troubleshooting from remote locations through Internet, intranet. Efficient use of human resources. Wireless communication systems. Continuous monitoring of systems and recording of data without use of human resources.*

Task 16 **Maintains alarm systems.**

Related Components: Fire detection, security and maintenance management systems, environmental monitoring and gas detection that include: panels, initiation devices such as heat detectors, smoke detectors, surveillance cameras and monitors, manual pull stations, motion detectors, intruder switches, sound detectors, oil sensors, heat, vibration, air quality analysis, water quality analysis, flow detectors, temperature, gas specific analyzers, gas sensors, annunciator devices such as bells, horns, strobes, dialers, printers and lights.

Tools and Equipment: Common hand tools, calibration tools and calibration standards.

Sub-task

16.01 Inspects alarm systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

16.01.01 knowledge of operation of alarm systems

16.01.02 knowledge of components of alarm systems such as detectors and switches

16.01.03 knowledge of inspection procedures and techniques for alarm systems

16.01.04 ability to visually examine alarm systems for damaged or abnormal operation such as detectors, manual stations and annunciation panels

16.01.05 ability to confirm operation of alarm systems

Sub-task

16.02 Replaces alarm systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

16.02.01	knowledge of operation of alarm systems and interchangeability
16.02.02	knowledge of types, sizes and function of alarm system components
16.02.03	knowledge of specifications for alarm system components
16.02.04	knowledge of installation procedures and techniques for alarm systems
16.02.05	knowledge of test equipment and procedures
16.02.06	ability to locate, mount and secure alarm system components
16.02.07	ability to terminate alarm system components such as batteries, strobe lights, horns and buzzers
16.02.08	ability to operate test equipment
16.02.09	ability to interpret test data such as voltage, system resistance and load

Sub-task

16.03 Troubleshoots alarm systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

16.03.01	knowledge of operation of alarm systems and components
16.03.02	knowledge of diagnostic equipment and procedures
16.03.03	knowledge of causes of component failure such as shorts, opens and grounds

Supporting Knowledge & Abilities

16.03.04 ability to isolate fault to component level

16.03.05 ability to operate diagnostic equipment

16.03.06 ability to interpret diagnostic data such as voltage, continuity and resistance

Sub-task

16.04 Repairs alarm systems.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

Supporting Knowledge & Abilities

16.04.01 knowledge of operation of alarm systems

16.04.02 knowledge of types, sizes, interchangeability and function of alarm system components such as fire alarms, process alarms and intrusion alarms

16.04.03 knowledge of procedures and techniques for repair, replacement, adjustment and modification of alarm system components

16.04.04 knowledge of test equipment and procedures for testing

16.04.05 ability to replace, adjust and modify alarm system components such as arming device, manual stations and photocells

16.04.06 ability to operate test equipment

16.04.07 ability to interpret test data such as resistance

16.04.08 ability to verify operation of repaired alarm system components

Sub-task

16.05 Services alarm systems.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

Supporting Knowledge & Abilities

16.05.01	knowledge of operation of alarm systems
16.05.02	knowledge of types, sizes and function of alarm system components
16.05.03	knowledge of procedures and techniques for servicing alarm system components such as manual stations
16.05.04	knowledge of operation of test equipment and procedures
16.05.05	knowledge of preventative/predictive maintenance schedule
16.05.06	ability to perform procedures such as cleaning
16.05.07	ability to calibrate components such as detectors and photo/motion sensors
16.05.08	ability to operate test equipment
16.05.09	ability to verify operation of alarm systems
16.05.10	ability to interpret data such as signal-in and signal-out

Task 17 Maintains paging systems.

Related Components: Amplifiers, microphones, speakers, radios, antennas, dialers, transmitters and receivers, keypads, power supplies, recorders, computers, printers, pagers and cabling.

Tools and Equipment: Common hand tools, hand sets, head sets, wire tracers, priming loads for antennas, specialized termination tools and degaussing coil.

Sub-task

17.01 Inspects paging systems.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
no	yes	yes	no	no	yes	yes	yes	yes	yes	ND	yes	NV

Supporting Knowledge & Abilities

17.01.01	knowledge of operation of paging systems
17.01.02	knowledge of components of paging systems such as cameras, speakers, transmitters and receivers
17.01.03	knowledge of inspection procedures and techniques for paging systems
17.01.04	knowledge of specifications for paging system components
17.01.05	ability to visually examine paging systems for pager audio level
17.01.06	ability to confirm operation of paging systems

Sub-task

17.02 Replaces paging systems.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
no	yes	yes	no	no	yes	yes	yes	yes	yes	ND	yes	NV

Supporting Knowledge & Abilities

17.02.01	knowledge of operation of paging systems
17.02.02	knowledge of types, sizes specifications and interchangeability of paging system components such as receivers and transmitters
17.02.03	knowledge of installation procedures and techniques for paging systems
17.02.04	knowledge of test equipment and procedures for testing paging systems
17.02.05	ability to locate, mount and secure paging system components
17.02.06	ability to fabricate parts such as mounting brackets and stands

Supporting Knowledge & Abilities

17.02.07 ability to operate test equipment

17.02.08 ability to interpret test data such as audio sound

17.02.09 ability to verify operation of paging and system components

Sub-task

17.03 Troubleshoots paging systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
no	yes	yes	no	no	yes	yes	yes	yes	yes	ND	yes	NV

17.03.01 knowledge of operation of components of paging systems such as cameras, speakers and microphones

17.03.02 knowledge of diagnostic equipment and procedures such as signal analyzers and voltage meters

17.03.03 knowledge of causes of faults such as signal distortion, noises and shielding

17.03.04 knowledge of specifications for components of paging systems

17.03.05 ability to isolate faults down to component levels

17.03.06 ability to operate diagnostic equipment

17.03.07 ability to interpret diagnostic data such as sounds and tones

Sub-task

17.04 Repairs paging systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
no	yes	yes	no	no	yes	yes	yes	yes	yes	ND	yes	NV

17.04.01 knowledge of operation of paging systems

Supporting Knowledge & Abilities

17.04.02 knowledge of types, sizes and interchangeability of components of paging systems

17.04.03 knowledge of specifications for paging system components

17.04.04 knowledge of procedures and techniques for repair, replacement, fabrication, modification, and adjustment of paging system components

17.04.05 knowledge of test equipment and procedures

17.04.06 ability to repair, adjust, replace, modify and fabricate paging system components

17.04.07 ability to operate test equipment

17.04.08 ability to interpret test data such as cables integrity (resistances) and voltage levels

17.04.09 ability to verify operation of repaired paging system components

Sub-task

17.05 Services paging systems.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
no	yes	yes	no	yes	yes	yes	yes	yes	yes	ND	yes	NV

Supporting Knowledge & Abilities

17.05.01 knowledge of operation of paging systems

17.05.02 knowledge of specifications for components of paging systems

17.05.03 knowledge of procedures and techniques of servicing such as cleaning and storage

17.05.04 knowledge of preventative/predictive maintenance schedules

17.05.05 knowledge of calibration procedures and techniques such as tone strength

17.05.06 knowledge of operation of test equipment and test procedures

Supporting Knowledge & Abilities

17.05.07 ability to calibrate components of systems

17.05.08 ability to perform procedures such as air cleaning and vacuuming of paging systems

17.05.09 ability to operate test equipment

17.05.10 ability to interpret test data such as signal strength and tone

Task 18 Maintains audio-visual systems.

Related Components: Amplifiers, microphones, speakers, cameras, monitors, radios, antennas, dialers, modems, transmitters and receivers, keypads, multi-media projectors, power supplies, recorders, computers, printers and cabling.

Tools and Equipment: Common hand tools, hand sets, portable monitors, wire tracers, network analyzers, computers, priming loads for antennas, specialized termination tools, degaussing coil and VCR cleaning tapes.

Sub-task

18.01 Inspects audio-visual systems.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
no	yes	yes	no	no	yes	yes	yes	yes	yes	ND	yes	NV

Supporting Knowledge & Abilities

18.01.01 knowledge of operation of audio-visual systems

18.01.02 knowledge of components of paging and audio-visual systems such as cameras, speakers, transmitters and receivers

18.01.03 knowledge of inspection procedures and techniques for audio-visual systems

18.01.04 knowledge of specifications for audio-visual system components

Supporting Knowledge & Abilities

18.01.05 ability to visually examine audio-visual systems for monitor display and clear definition audio level

18.01.06 ability to confirm operation of audio-visual systems

Sub-task

18.02 Replaces audio-visual systems.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
no	yes	yes	no	no	yes	yes	yes	yes	yes	ND	yes	NV

Supporting Knowledge & Abilities

18.02.01 knowledge of operation of audio-visual systems

18.02.02 knowledge of types, sizes, specifications and interchangeability of audio-visual system components such as receivers, transmitters, monitors and lenses

18.02.03 knowledge of installation procedures and techniques for audio-visual systems

18.02.04 knowledge of test equipment and procedures for testing

18.02.05 ability to locate, mount and secure audio-visual system components

18.02.06 ability to fabricate parts such as mounting brackets and stands

18.02.07 ability to operate test equipment

18.02.08 ability to interpret test data such as display, tone, audio sound and recording

18.02.09 ability to verify operation of audio-visual system components

Sub-task

18.03 Troubleshoots audio-visual systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
no	yes	yes	no	no	yes	yes	yes	yes	yes	ND	yes	NV

18.03.01 knowledge of operation of components of audio-visual systems such as cameras, speakers, VCRs and microphones

18.03.02 knowledge of diagnostic equipment and procedures such as signal analyzers and voltage meters

18.03.03 knowledge of causes of faults such as signal distortion, noises, corrupted display and shielding

18.03.04 knowledge of specifications for components of audio-visual systems

18.03.05 ability to isolate faults down to component levels

18.03.06 ability to operate diagnostic equipment

18.03.07 ability to interpret diagnostic data such as sounds, tones and data collisions

Sub-task

18.04 Repairs audio-visual systems.

Supporting Knowledge & Abilities

(NOT COMMON CORE)

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
no	yes	yes	no	no	yes	yes	yes	yes	yes	ND	no	NV

18.04.01 knowledge of operation of audio-visual systems

18.04.02 knowledge of types, sizes and interchangeability of components of audio-visual systems

18.04.03 knowledge of specifications for paging and audio-visual system components

Supporting Knowledge & Abilities

18.04.04	knowledge of procedures and techniques for repair, replacement, fabrication, modification and adjustment of audio-visual system components
18.04.05	knowledge of test equipment and procedures
18.04.06	ability to repair, adjust, replace, modify and fabricate audio-visual system components
18.04.07	ability to operate test equipment
18.04.08	ability to interpret test data such as cables integrity (resistances), voltage levels and display clarity
18.04.09	ability to verify operation of repaired audio-visual system components

Sub-task

18.05 Services audio-visual systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
no	yes	yes	no	yes	yes	yes	yes	yes	yes	ND	yes	NV

18.05.01	knowledge of operation of audio-visual systems
18.05.02	knowledge of specifications for components of audio-visual systems
18.05.03	knowledge of procedures and techniques of servicing such as cleaning, storage and media replacement
18.05.04	knowledge of preventative/predictive maintenance schedules
18.05.05	knowledge of calibration procedures and techniques such as tone strength and audio-visual signal strength
18.05.06	knowledge of operation of test equipment and test procedures

Supporting Knowledge & Abilities

18.05.07	ability to calibrate components of audio-visual systems
18.05.08	ability to perform procedures such as air cleaning and vacuuming of audio-visual systems
18.05.09	ability to operate test equipment
18.05.10	ability to interpret test data such as signal strength, tone and display clarity

BLOCK G

CONTROL SYSTEMS

Trends: *Move to industrial electrician performing DCS/SCADA. Towards solid state protection devices coordination/networking of protection devices.*

Task 19 **Maintains protection devices.**

Related Components: Protective relays such as under voltage, ground fault interrupt, instantaneous current, phase loss, differential current, bus faults, overloads, circuit breakers, temperature, pressure, vibration and speed sensors, switches and fuses.

Tools and Equipment: Common hand tools, multi amp testers, synchronizer timers, test sets, fault simulators and calibration, computers, ammeters, blocking switches (sandwich or wafer).

Sub-task

19.01 Inspects protection devices.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

19.01.01	knowledge of operation characteristics of protective devices
19.01.02	knowledge of specification for protective devices
19.01.03	knowledge of inspection procedures and techniques
19.01.04	ability to do a visual/physical examination for indicators such as flags or switches, wire integrity, foreign objects, dust, dirt, discolouration and excessive heat
19.01.05	ability to identify abnormal conditions

Sub-task

19.02 Replaces protection devices.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

19.02.01	knowledge of installation procedures and techniques
19.02.02	knowledge of characteristics and specifications of protective devices, sizes, ratings, speeds, types and percent errors
19.02.03	knowledge of fabrication techniques
19.02.04	knowledge of testing procedures and equipment
19.02.05	ability to define system requirements
19.02.06	ability to select appropriate components
19.02.07	ability to fabricate mounting devices such as panel covers, bases and brackets

Supporting Knowledge & Abilities

19.02.08 ability to mount and secure components

19.02.09 ability to verify operation of protective devices

Sub-task

19.03 Troubleshoots protection devices.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

19.03.01 knowledge of system and components

19.03.02 knowledge of component capabilities

19.03.03 knowledge of probable causes of fault and corrective methods

19.03.04 knowledge of procedures for isolation of suspect devices

19.03.05 knowledge of diagnostic/test equipment such as multi-meters and operational history of devices

19.03.06 knowledge of repair priorities

19.03.07 ability to isolate suspect devices

19.03.08 ability to operate diagnostic equipment

19.03.09 ability to interpret test results

19.03.10 ability to conduct diagnostic test

Sub-task

19.04 Repairs protection devices.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

19.04.01 knowledge of specifications and characteristics of protective devices such as ratings, sizes, speeds and types

Supporting Knowledge & Abilities

19.04.02	knowledge of replacement, adjustment, test and calibration procedures and techniques
19.04.03	ability to replace protective devices
19.04.04	ability to adjust protective devices such as tension, settings, set points and parameters
19.04.05	ability to adjust protective devices such as fuse holders
19.04.06	ability to test and calibrate components such as time dials, temperature, set points and overload relays
19.04.07	ability to verify operation of replaced, adjusted and calibrated devices

Sub-task

19.05 Services protection devices.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

Supporting Knowledge & Abilities

19.05.01	knowledge of specifications and parameters for protective devices
19.05.02	knowledge of preventative maintenance procedures and schedules
19.05.03	knowledge of test and calibration procedures
19.05.04	ability to perform preventative maintenance procedures such as cleaning and adjusting
19.05.05	ability to calibrate devices
19.05.06	ability to verify operation of serviced devices

Task 20 **Maintains input/output field devices.**

Related Components:

Input devices such as push button, switches such as selection switches, limit switches, proximity transmitters, flow transmitters, level transmitters, pressure transmitters, temperature transmitters, photo cell switches, photo eye switches, proportional controllers, density transmitters, viscosity transmitters, timers, turbidity transmitters, PH transmitters, speed transmitters, sound switches, counters, torque switches, vibration transmitters, x-ray thickness transmitters, voltage transmitters, current transducers, rheostats, potentiometers, auxiliary contacts; Output devices such as relays, actuators, solenoids, servo valves/proportional valves, convertors, I/P or P/I, T/P or T/I, speeder motors, step motors, indicators such as LED, lights, buzzers, horns and meters.

Tools and Equipment:

Common hand tools, specialized test instruments, loop calibrators, dry block calibrators, u-tube manometers, pressure and pump/dead weight testers.

Sub-task

20.01 **Inspects input/output field devices.**

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

20.01.01 knowledge of types and uses of input/output field devices

20.01.02 knowledge of operation of input/output field devices

20.01.03 knowledge of inspection procedures and techniques for input/output field devices

20.01.04 ability to visually and physically examine device for damage, wear, leakage, stress and abnormal heat

20.01.05 ability to functionally test devices to confirm device operation

Sub-task

20.02 Replaces input/output field devices.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

20.02.01	knowledge of installation procedures and techniques for input/output field devices
20.02.02	knowledge of types, sizes and interchangeability of components
20.02.03	knowledge of specifications and possible future requirements
20.02.04	ability to mount and secure input/output field device components
20.02.05	ability to initialize new input/output field devices such as program and calibrate
20.02.06	ability to verify operation of installed input/output field devices

Sub-task

20.03 Troubleshoots input/output field devices.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

20.03.01	knowledge of types and sizes of components and capabilities
20.03.02	knowledge of diagnostic equipment such as loop calibrators or multi-meters
20.03.03	knowledge of typical faults
20.03.04	knowledge of diagnostic procedures and techniques
20.03.05	ability to conduct diagnostic tests
20.03.06	ability to interpret data

Supporting Knowledge & Abilities

20.03.07 ability to operate diagnostic equipment

20.03.08 ability to isolate faults

Sub-task

20.04 Repairs input/output devices.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

20.04.01 knowledge of types, ratings and sizes of field input/output devices

20.04.02 knowledge of replacement, adjustment, calibration and alignment procedures and techniques

20.04.03 knowledge of operation field input/output devices

20.04.04 ability to replace components

20.04.05 ability to adjust components

20.04.06 ability to align components such as photo eyes, photo cells, limit switches and proximities

20.04.07 ability to fabricate components such as mounting brackets and bases

20.04.08 ability to calibrate components such as transmitters, transducers and proportional valves

20.04.09 ability to verify operation of replaced, aligned, adjusted and calibrated components

Sub-task

20.05 Services input/output field devices.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

20.05.01	knowledge of field input/output device components and parts
20.05.02	knowledge of procedures and techniques for servicing input/output field devices
20.05.03	knowledge of preventative maintenance procedures and schedules
20.05.04	ability to perform preventative maintenance procedures
20.05.05	ability to calibrate components such as transmitters, transducers and meters
20.05.06	ability to clean components
20.05.07	ability to align components such as photo eyes and photo cells
20.05.08	ability to verify operation of serviced components

Task 21 Maintains programmable logic controllers (PLC).

Related Components: CPUs, power supplies, racks (back plate), analog input cards, analog output cards, digital input cards, digital output cards, communication cards, cabling/wiring and harnesses.

Tools and Equipment: Common hand tools, test cards, extension cards, computers, PLC software, interface software and hand held programmers.

Sub-task

21.01 Inspects programmable logic controllers.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

21.01.01 knowledge of programmable logic controller system components such as CPUs, cabinets and input/output racks

21.01.02 knowledge of inspection procedures for programmable logic controllers

21.01.03 ability to visually examine components for fault lights, dust and damage

21.01.04 ability to confirm system integrity

Sub-task

21.02 Replaces programmable logic controllers.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

21.02.01 knowledge of installation procedures and techniques

21.02.02 knowledge of types, uses and requirements of components

21.02.03 knowledge of operating system voltages

21.02.04 knowledge of system specifications and future requirements

21.02.05 knowledge of operation and associated software

21.02.06 ability to mount and secure components such as racks and power supplies

21.02.07 ability to connect components such as cards and associated wiring

21.02.08 ability to configure systems such as cards and peripherals

Supporting Knowledge & Abilities

21.02.09 ability to operate systems and associated software

Sub-task

21.03 Troubleshoots programmable logic controllers.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

21.03.01 knowledge of system components and their capabilities

21.03.02 knowledge of probable cause of faults and corrective methods

21.03.03 knowledge of software programs and their diagnostic abilities

21.03.04 knowledge of diagnostic procedures

21.03.05 knowledge of system configuration procedures

21.03.06 ability to operate diagnostic software

21.03.07 ability to interpret results and recognize faults

21.03.08 ability to isolate fault down to hardware or software

Sub-task

21.04 Repairs programmable logic controllers.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

21.04.01 knowledge of replacement techniques and procedures such as card replacement and software downloads

Supporting Knowledge & Abilities

21.04.02	knowledge of types, sizes, capabilities and capacities of components
21.04.03	knowledge of software versions
21.04.04	ability to download software
21.04.05	ability to replace components such as cards, power supplies and CPUs
21.04.06	ability to verify operation of replaced components and software

Sub-task

21.05 Services programmable logic controllers.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

21.05.01	knowledge of service and test procedures and techniques of programmable logic controllers
21.05.02	knowledge of preventative maintenance procedures and schedule
21.05.03	knowledge of PLC system components and parts such as hardware, software and backup procedures
21.05.04	ability to perform preventative maintenance procedures
21.05.05	ability to verify operation of system
21.05.06	ability to back up software

Sub-task

21.06 Configures programmable logic controllers.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

21.06.01	knowledge of operating system requirements such as on or off-line programming
21.06.02	knowledge of PLC software/programming language
21.06.03	knowledge of software capabilities
21.06.04	knowledge of configuration procedures and techniques
21.06.05	ability to operate systems
21.06.06	ability to program and/or modify programming logic
21.06.07	ability to verify configuration results
21.06.08	ability to upload/download programs

Sub-task

21.07 Optimizes programmable logic controllers

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

21.07.01	knowledge of performance parameters of systems
21.07.02	knowledge of capabilities and limitations of systems and components
21.07.03	knowledge of modification procedures and techniques of software and hardware
21.07.04	ability to modify system parameters
21.07.05	ability to modify hardware capabilities

Supporting Knowledge & Abilities

21.07.06 ability to change programming logic

Task 22 Maintains distributed control and SCADA systems.

Related Components: Screens, CPUs, power supplies, racks, analog input/output cards, digital input/output cards, communication modules, history modules, advanced process manager modules, graphic user interface, control/consoles, cables/wires, keyboard engineering/operators and moves.

Tools and Equipment: Common hand tools and loop calibrators.

Sub-task

22.01 Inspects distributed control and SCADA systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

22.01.01 knowledge of DCS/SCADA system components such as CPUs, cabinet layouts, input/output racks, networks, V-Sat, fibre optics and associated equipment and Cat-5

22.01.02 knowledge of inspection procedures and techniques

22.01.03 ability to visually examine components for fault lights, dust, damage and foreign objects

22.01.04 ability to confirm system integrity

Sub-task

22.02 Replaces distributed control and SCADA systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

22.02.01	knowledge of installation procedures and techniques for DCS/SCADA
22.02.02	knowledge of components uses, types and requirements
22.02.03	knowledge of operating system voltages, grounding and isolation methods
22.02.04	knowledge of system specifications and future requirements
22.02.05	knowledge of operation and associated software
22.02.06	knowledge of system configuration
22.02.07	ability to mount and secure components such as displays, racks and power supplies
22.02.08	ability to connect isolation equipment, cards and associated wiring, V-Sat, fibre optics and associated equipment and Cat-5
22.02.09	ability to configure system and associated software such as cards and peripherals
22.02.10	ability to operate systems

Sub-task

22.03 Troubleshoots distributed control and SCADA systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

22.03.01	knowledge of DCS/SCADA system network components and capabilities
22.03.02	knowledge of probable causes of faults

Supporting Knowledge & Abilities

22.03.03	knowledge of system configuration procedures
22.03.04	knowledge of software and program and diagnostic capabilities
22.03.05	knowledge of diagnostic procedures
22.03.06	ability to operate diagnostic software and/or equipment
22.03.07	ability to interpret diagnostic results and recognize faults
22.03.08	ability to isolate fault down to hardware and software networks

Sub-task

22.04 Repairs distributed control and SCADA systems.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

Supporting Knowledge & Abilities

22.04.01	knowledge of replacement techniques and procedures such as card replacement and software downloads
22.04.02	knowledge of types, sizes, capabilities and capacities of components
22.04.03	knowledge of software versions
22.04.04	knowledge of network component characteristics such as baud rate and fibre optic/co-ax configuration
22.04.05	ability to download software
22.04.06	ability to replace components such as cards, power supplies and CPUs
22.04.07	ability to verify operation of replaced components or software

Sub-task

22.05 Services distributed control and SCADA systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

22.05.01	knowledge of service and test procedures and techniques for DCS/SCADA systems
22.05.02	knowledge of preventative maintenance procedures and schedule
22.05.03	knowledge of system components and parts such as hardware and software
22.05.04	knowledge of backup procedures
22.05.05	ability to perform preventative maintenance procedures such as cleaning and voltage testing
22.05.06	ability to verify operation of system
22.05.07	ability to backup software

BLOCK H

CLIMATE/ENVIRONMENT CONTROL SYSTEMS

Trends: *Increased efficiency from cost/benefit perspective. Require more stringent environmental regulations. Increased heightened awareness of environmental issues. Technological advances in monitoring the environment. More accurate monitoring devices and new technology for energy management.*

Task 23 **Maintains electrical components of heating systems.**

Related Components: Valve actuators, contactors, louver actuators, elements, safety devices, circulatory pumps, temperature controllers, valves, cabling, fans, breakers, burner motors, ignition transformers, fire sensors, fuel pumps, feed back devices and vaporizers.

Tools and Equipment: Common hand tools, thermometers, hand held gas monitors, leak detectors and dry block calibrators.

Sub-task

23.01 Inspects electrical components of heating systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

23.01.01 knowledge of types and components of heating systems

23.01.02 knowledge of operation of heating systems components

23.01.03 knowledge of inspection techniques and procedures

23.01.04 ability to recognize damaged, worn, defective or hazardous components such as actuators, contactors and sensors

23.01.05 ability to recognize abnormal heat, sounds and odours

23.01.06 ability to functionally test control elements such as thermostats, relays and actuators

Sub-task

23.02 Replaces electrical components of heating systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

23.02.01	knowledge of installation procedures and techniques of heating systems
23.02.02	knowledge of types, sizes, and ratings of parts/components of heating systems
23.02.03	ability to mount and secure electrical components of heating systems
23.02.04	ability to connect electrical equipment of heating system to power supply
23.02.05	ability to verify operation of installed electrical equipment of heating systems

Sub-task

23.03 Troubleshoots electrical components of heating systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

23.03.01	knowledge of heating system control concepts
23.03.02	knowledge of types and ratings of electrical components of heating systems such as sensors, relays and controllers
23.03.03	knowledge of faults in heating systems such as failed components
23.03.04	knowledge of diagnostic procedures and techniques
23.03.05	ability to employ diagnostic equipment such as multi-meters and calibrators
23.03.06	ability to recognize faults

Supporting Knowledge & Abilities

23.03.07 ability to isolate system faults to parts/components

Sub-task

23.04 Repairs electrical components of heating systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

23.04.01 knowledge of repair, replacement and adjustment procedures and techniques

23.04.02 knowledge of types and ratings and operation of electrical components of heating systems

23.04.03 knowledge of heating system control concepts

23.04.04 ability to replace components/parts of electrical heating systems such as sensors, relays and controllers

23.04.05 ability to adjust sensors and controls

23.04.06 ability to verify operation of repaired, replaced and adjusted components/parts

Sub-task

23.05 Services electrical components of heating systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

23.05.01 knowledge of procedures and techniques for servicing electrical components of heating systems

23.05.02 knowledge of types, ratings and operation of electrical components of heating systems

Supporting Knowledge & Abilities

23.05.03	knowledge of calibration procedures and techniques
23.05.04	knowledge of calibration devices such as manometers, pressure simulators and multi-meters
23.05.05	ability to employ calibration equipment
23.05.06	ability to functionally test heating systems

Task 24 **Maintains electrical components of cooling systems.**

Related Components: Louver actuators, fan motors, cooling value actuators, feed back devices, safety devices, temperature controllers, circulating pumps, compressor motors, starters, contactors, breakers, cabling.

Tools and Equipment: Common hand tools, hand held gas monitors, leak detectors, dry block calibrators and thermometers.

Sub-task

24.01 **Inspects electrical components of cooling systems.**

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	no	yes	yes	yes	yes	yes	ND	yes	NV

24.01.01	knowledge of components of cooling systems
24.01.02	knowledge of operation of cooling system components
24.01.03	knowledge of inspection procedures and techniques of cooling system
24.01.04	ability to recognize damaged, worn, defective or hazardous components such as actuators and sensors
24.01.05	ability to recognize abnormal heat and sounds

Supporting Knowledge & Abilities

24.01.06 ability to functionally test control elements such as thermostats, relays and actuators

Sub-task

24.02 Troubleshoots electrical components of cooling systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	no	yes	yes	yes	yes	yes	ND	yes	NV

24.02.01 knowledge of cooling system control concepts

24.02.02 knowledge of types and ratings of electrical components of cooling systems such as sensors, relays and controllers

24.02.03 knowledge of faults in cooling systems such as failed components

24.02.04 knowledge of diagnostic equipment

24.02.05 knowledge of diagnostic procedures and techniques

24.02.06 ability to employ diagnostic equipment such as multi-meters and calibrators

24.02.07 ability to recognize faults in cooling systems

24.02.08 ability to isolate system faults down to components/parts

Sub-task

24.03 Repairs electrical components of cooling systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	no	yes	yes	yes	yes	yes	ND	yes	NV

24.03.01 knowledge of repair, replacement and adjustment procedures and techniques

24.03.02 knowledge of types, ratings and operation of electrical components of cooling systems

24.03.03 knowledge of cooling system control concepts

24.03.04 ability to replace component parts of electrical cooling systems such as sensors, relays and controllers

24.03.05 ability to adjust sensors and controllers

24.03.06 ability to verify operation of repaired, replaced and adjusted components/parts

Sub-task

24.04 Services electrical components of cooling systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	no	yes	yes	yes	yes	yes	ND	yes	NV

24.04.01 knowledge of procedures and techniques for servicing electrical components of cooling systems

24.04.02 knowledge of types, ratings and operation of electrical components of cooling systems

24.04.03 knowledge of calibration procedures and techniques of electrical components of cooling systems

24.04.04 knowledge of calibration devices such as manometers, pressure simulators and multi-meters

Supporting Knowledge & Abilities

24.04.05 ability to employ calibration equipment

24.04.06 ability to functionally test cooling systems

Task 25 Maintains building automation systems.

Related Components: Temperature sensors, humidity sensors, motion sensors, control panels, computers, cabling/wiring, relays, actuators, modems, modulating valves, actuators, energy management software.

Tools and Equipment: Common hand tools, lap top computers and thermometers.

Sub-task

25.01 Inspects building automation systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

25.01.01 knowledge of components of building automation systems

25.01.02 knowledge of operation of components of building automation systems

25.01.03 knowledge of inspection procedures and techniques

25.01.04 knowledge of building automation systems software

25.01.05 ability to recognize defective components of building automation systems such as temperature out-of-control and system not responding

25.01.06 ability to functionally test control elements such as actuators, sensors and solenoids

25.01.07 ability to interpret building automation systems software information

Sub-task

25.02 Replaces building automation systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

25.02.01 knowledge of installation procedures and techniques

25.02.02 knowledge of types, sizes and ratings of building automation system components

25.02.03 knowledge of HVAC (heating, ventilation, air conditioning) procedures and techniques

25.02.04 knowledge of building automation system programming techniques

25.02.05 ability to mount and secure building automation systems

25.02.06 ability to connect to field devices and power source

25.02.07 ability to verify operation of installed building automation systems

25.02.08 ability to program building automation system software

Sub-task

25.03 Troubleshoots building automation systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

25.03.01 knowledge of building automation systems and software

25.03.02 knowledge of types and ratings of connected components/parts such as temperature sensors and actuators

25.03.03 knowledge of faults such as temperature out-of-control and not responding to system

Supporting Knowledge & Abilities

25.03.04 ability to employ diagnostic devices such as portable computers, multi-meters and thermometers

25.03.05 ability to recognize faults in building automation systems

25.03.06 ability to isolate system faults to components/parts

Sub-task

25.04 Repairs building automation systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

25.04.01 knowledge of repair, replacement, reprogramming and adjustment procedures and techniques

25.04.02 knowledge of types, ratings and operation of components/parts

25.04.03 ability to replace components such as actuators, sensors and valves

25.04.04 ability to adjust components such as actuators

25.04.05 ability to modify building automation system software

25.04.06 ability to backup building automation system software

25.04.07 ability to verify operation of repaired, replaced, reprogrammed and adjusted components/parts

Sub-task

25.05 Services building automation systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

25.05.01	knowledge of procedures and techniques for servicing building automation systems
25.05.02	knowledge of types and ratings of components/parts for building automation systems
25.05.03	knowledge of calibration procedures and techniques
25.05.04	knowledge of calibration devices such as air supply and current source potentiometers
25.05.05	ability to backup software
25.05.06	ability to employ calibration devices

Task 26 Maintains environmental regulating systems.

Related Components: Leak detection systems, ultraviolet water treatment devices, breakers, contactors, wiring, cabling, high voltage switching compartments, high voltage regulators, motors, heaters, pumps, total reduced solid monitors, air samplers, colour monitors, stack monitors, motorized actuators and transducers.

Tools and Equipment: Common hand tools, high voltage gloves, hot gloves, hot sticks, high voltage testers, gas monitors, oil test kits and special calibration tools for monitoring equipment.

Sub-task

26.01 Inspects environmental regulating systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

26.01.01	knowledge of systems such as waste management, water treatment, flow regulation and stack emissions
26.01.02	knowledge of components of the particulate systems
26.01.03	knowledge of characteristics, parameters and specifications such as sizes, types and ratings
26.01.04	knowledge of inspection procedures and techniques
26.01.05	knowledge of environment related regulations
26.01.06	ability to visually and physically examine components of the system
26.01.07	ability to recognize damaged, defective, worn and hazardous components

Sub-task

26.02 Replaces environmental regulating systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

26.02.01	knowledge of installation procedures and techniques for environmental regulating system related components
26.02.02	knowledge of characteristics, parameters and specifications of components
26.02.03	knowledge of regulations relating to environmental systems
26.02.04	ability to mount and secure components

Supporting knowledge & Abilities

26.02.05	ability to fabricate components such as mounting brackets
26.02.06	ability to connect components
26.02.07	ability to select components to be used
26.02.08	ability to verify operation of installed components

Sub-task

26.03 Troubleshoots environmental regulating systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

26.03.01	knowledge of system and components, capabilities, limitations and interchangeabilities
26.03.02	knowledge of probable causes of faults in environmental regulating systems
26.03.03	knowledge of diagnostic requirements, procedures and techniques
26.03.04	knowledge of diagnostic equipment such as dam leak detection, meters and stack monitors
26.03.05	knowledge of environmental regulations
26.03.06	knowledge of repair priorities
26.03.07	ability to operate diagnostic equipment
26.03.08	ability to conduct tests
26.03.09	ability to analyze test data
26.03.10	ability to isolate defective components

Sub-task

26.04 Repairs environmental regulating systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

26.04.01	knowledge of system components, characteristics, parameters and specifications
26.04.02	knowledge of replacement, adjustment, calibration and test procedures and techniques
26.04.03	knowledge of test equipment and procedures
26.04.04	ability to replace components
26.04.05	ability to adjust components such as level switches, actuators, transformers, regulators and transducers
26.04.06	ability to calibrate components such as pressure switches, regulators and transducers
26.04.07	ability to verify operation of replaced, adjusted and calibrated components

Sub-task

26.05 Services environmental regulating systems.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	ND	yes	NV

26.05.01	knowledge of preventative maintenance procedures, schedules and techniques for environmental regulating systems
26.05.02	knowledge of components and parts for environmental regulating systems
26.05.03	knowledge of calibration procedures for environmental regulating systems
26.05.04	ability to perform preventative maintenance procedures

Supporting Knowledge & Abilities

26.05.05 ability to calibrate components such as pressure switches, regulators and transducers

26.05.06 ability to verify operation of serviced components

APPENDICES

TOOLS AND EQUIPMENT

Common Hand Tools

adjustable wrench
allen wrenches
chisel
crimping pliers
drill bits
feeler gauges
file
fish tape
flashlight
fuse puller
hack saw
hammer
hex key (metric/standard)
hole saw
jumpers
knife
knock outs
linesman pliers
multi-meter
needle nose pliers
nut drivers
pipe benders
pullers
punch
screw drivers
screw starter
scribe
semi-con remover
side cutters
slide lock pliers
socket set (M & S)
solvent gun
spline keys
tap
tape measure
telescopic magnet
telescopic mirror
torque wrench
wire strippers
wrenches

Power Hand Tools

circular saw
drill
grinder
heat gun
hydraulic crimper
jig saw
PVC bender
pipe bender
pipe threading machine
reciprocating saw
soldering equipment
wire puller

Powder-Actuated Tools

explosive-actuated fastening tool
powder-actuated crimping device
thermit-welding equipment (CAD-welding)

Stationary Power Tools

bearing heater
buffer
chop saw
drill press
grinder
hydraulic power unit
hydraulic press
parts washer
sand blaster
threading machine
under cutting machine

Electrical Test Equipment and Diagnostic

ammeter
chart recorder
circuit tracer
dry block calibrator
fault finder
frequency meter
geiger counter
hi-pot tester
hydrometer
infrared temperature gun/camera
instrumentation loop calibrator
insulation tester
laptop computer
lumin meter (testing light)
multi-meter
oscilloscope
phase sequence tester
phase stick
potential tester
pressure pump
thermal graphic equipment
timer
transformer turns ratiometer
wheatstone bridge

Measuring Equipment – Mechanical

accelerometer
dial indicators
diameter tape
distance measuring wheel
feeler gauges
hydrometer
micrometers
pressure gauges
tachometer
vernier calipers

Rigging, Hoisting, Lifting

beam clamps
block and tackle
chain fall
hoists
lifting eyes
ropes
shackles
slings
tow motor/fork lift

Ladders and Platforms etc.

extension ladder
portable stairs
powered man lift
scaffolds
staging
step ladder

Personal Protective Equipment

dosimeter
ear protectors
face shield
fall arrest equipment
fall restraint equipment
flame retardant clothing
gas detectors
glasses/goggles
ground cluster
hard hat
harness
high voltage gloves
hot gloves
hot stick
protective apron
protective gloves/gauntlets
respirator
S.C.B.A. (Self Contained Breathing Apparatus)
safety foot-ware

ABBREVIATIONS

CSA	Canadian Standard Association
ECUSR	Electrical Code Utility Safety Regulation (high voltage)
GFI	Ground Fault Interrupter
GTO	Gate Turn On
IEEE	Institute of Electrical and Electronics Engineers
IESS	Illumination Engineering Society Standards
ISA	Instrumentation Society of America
MMI	Man Machine Interface
MMS	Maintenance Management Systems
OH&S	Occupational Health and Safety
P and ID	Pipe and Instrumentation Drawings
PLC	Programmable Logic control Systems
RTU	Remote Terminal Unit
SCADA	Supervisory Control and Data Acquisition
SCBA	Self Contained Breathing Apparatus
SST	Special Service Tools
TDG	Transportation of Dangerous Goods
TTR	Transformer Turn Ratiometer
ULC	Underwriters Laboratory Canada
UPS	Uninterruptible Power Supply Systems
VFD	Variable Frequency Drives

BLOCKS AND TASKS WEIGHTING

BLOCK A OCCUPATIONAL SKILLS

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	National Average
%	9	15	10	12	20	15	20	8	10	15	ND	20	NV	14%

Task 1 Utilizes drawings, codes, standards, and service and operating manuals.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	
%	37	33	50	56	30	40	30	38	30	45	ND	60	NV	41%

Task 2 Employs tools and equipment.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	
%	25	33	25	22	30	30	35	25	20	25	ND	20	NV	26%

Task 3 Demonstrates work practices and procedures.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	
%	38	34	25	22	40	30	35	37	50	30	ND	20	NV	33%

BLOCK B WIRING AND LIGHTING SYSTEMS

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	National Average
%	12	20	14	9	12	20	20	17	19	15	ND	20	NV	16%

Task 4 Installs and maintains illumination systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	
%	15	10	20	20	25	25	25	18	21	30	ND	20	NV	21%

Task 5 Maintains single and three-phase AC systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	
%	31	30	40	38	25	30	25	29	32	20	ND	40	NV	31%

Task 6 Maintains DC systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	
%	26	25	10	23	25	15	25	12	15	20	ND	25	NV	20%

Task 7 Maintains grounding, bonding and cathodic protection systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	
%	28	30	30	19	25	25	20	29	27	15	ND	10	NV	23%

Task 8 Maintains seismic restraint systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	
%	0	5	0	0	0	5	5	12	5	15	ND	5	NV	5%

BLOCK C POWER DISTRIBUTION AND GENERATING SYSTEMS

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	National Average
%	19	10	15	18	12	15	12	18	11	20	ND	10	NV	15%

Task 9 Maintains high voltage power distribution systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	
%	39	20	20	37	20	35	50	33	45	35	ND	30	NV	33%

Task 10 Maintains low voltage power distribution systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	
%	29	50	60	41	50	45	30	33	37	45	ND	40	NV	42%

Task 11 Maintains direct current power systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	
%	32	30	20	22	30	20	20	34	18	20	ND	30	NV	25%

BLOCK D ELECTRICAL EQUIPMENT

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	National Average
%	20	15	25	20	12	20	18	20	12	10	ND	10	NV	16%

Task 12 Maintains rotating equipment and associated controls.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	
%	62	65	50	59	50	50	45	50	58	50	ND	60	NV	55%

Task 13 Maintains drives and associated controls.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	
%	38	35	50	41	50	50	55	50	42	50	ND	40	NV	45%

BLOCK E EMERGENCY AND STANDBY SYSTEMS

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	National Average
%	12	10	3	8	10	8	5	7	7	8	ND	10	NV	8%

Task 14 Maintains uninterruptible power supply systems (UPS).

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	
%	41	65	50	45	50	45	50	29	43	40	ND	50	NV	46%

Task 15 Maintains standby power generating systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	
%	59	35	50	55	50	55	50	71	57	60	ND	50	NV	54%

BLOCK F COMMUNICATION SYSTEMS

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	National Average
%	6	5	3	6	6	7	5	8	10	7	ND	5	NV	6%

Task 16 Maintains alarm systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	
%	100	50	60	100	100	60	50	50	60	50	ND	40	NV	66%

Task 17 Maintains paging systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	
%	0	25	10	0	0	20	20	25	20	20	ND	40	NV	16%

Task 18 Maintains audio-visual systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	
%	0	25	30	0	0	20	30	25	20	30	ND	20	NV	18%

BLOCK G CONTROL SYSTEMS

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	National Average
%	14	20	20	21	20	8	15	15	18	15	ND	20	NV	17%

Task 19 Maintains protection devices.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	
%	24	30	20	21	30	20	20	20	28	18	ND	25	NV	23%

Task 20 Maintains input/output field devices.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	
%	22	40	20	32	30	30	20	27	28	22	ND	30	NV	27%

Task 21 Maintains programmable logic controllers (PLC).

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	
%	34	20	50	30	20	30	40	33	22	42	ND	25	NV	32%

Task 22 Maintains distributed control and SCADA systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	
%	20	10	10	17	20	20	20	20	22	18	ND	20	NV	18%

BLOCK H CLIMATE/ENVIRONMENT CONTROL SYSTEMS

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	National Average
%	8	5	10	6	8	7	5	7	13	10	ND	5	NV	8%

Task 23 Maintains electrical components of heating systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	
%	30	20	25	25	40	25	25	29	23	30	ND	30	NV	28%

Task 24 Maintains electrical components of cooling systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	
%	30	20	25	22	0	25	25	14	23	20	ND	30	NV	21%

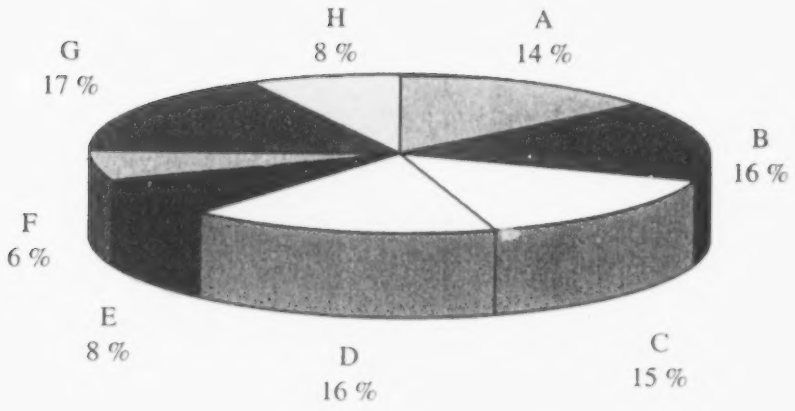
Task 25 Maintains building automation systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	
%	20	40	25	25	30	30	40	29	31	30	ND	25	NV	29%

Task 26 Maintains environmental regulating systems.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	
%	20	20	25	28	30	20	10	28	23	20	ND	15	NV	22%

PIE CHART *
Industrial Electrician



TITLES OF BLOCKS

Block A	Occupational Skills	Block E	Emergency and Standby Systems
Block B	Wiring and Lighting Systems	Block F	Communication Systems
Block C	Power Distribution and Generating Systems	Block G	Control Systems
Block D	Electrical Equipment	Block H	Climate/Environment Control Systems

* The average percentage of the total number of questions on an Interprovincial examination, assigned to assess each block of the analysis, as derived from the collective input from workers within the occupation from all areas of Canada Interprovincial examinations typically have from one hundred up to one hundred and fifty multiple choice questions on each examination.

BLOCKS	TASKS	SUB-TASKS									
A Occupational Skills	1. Utilizes drawings, codes, standards and service and operating manuals.	1.01 Interprets blueprints, drawings and schematics.	1.02 Modifies drawings and schematics.	1.03 Interprets service and operating manuals, specifications and technical bulletins.	1.04 Complies with government codes, standards and regulations.						
	2. Employs tools and equipment.	2.01 Uses and services hand tools.	2.02 Operates and services portable power tools.	2.03 Operates powder-actuated tools.	2.04 Operates and services stationary power tools.	2.05 Uses access equipment.	2.06 Operates and maintains material handling equipment.	2.07 Uses mechanical measuring equipment.	2.08 Operates electrical testing and diagnostic tools.	2.09 Operates computer systems.	
	3. Demonstrates work practices and procedures.	3.01 Conducts work area inspection.	3.02 Installs fasteners, fittings and connectors.	3.03 Performs lock-out and tagging.	3.04 Installs conduit.	3.05 Performs electrical wiring and termination operations.	3.06 Installs raceways, cable trays, busways and associated components.	3.07 Cleans and lubricates parts and components.	3.08 Troubleshoots common electrical devices associated with pneumatic/hydraulic/ mechanical systems.	3.09 Services mechanical components of electrical equipment.	3.10 Completes work-related documentation.
B Wiring and Lighting Systems	4. Installs and maintains illumination systems.	4.01 Inspects illumination systems.	4.02 Replaces illumination systems.	4.03 Troubleshoots illumination systems.	4.04 Repairs illumination systems.						
	5. Maintains single and three-phase AC systems.	5.01 Inspects single and three-phase AC systems.	5.02 Replaces single and three-phase AC systems.	5.03 Troubleshoots single and three-phase AC systems.	5.04 Repairs single and three-phase AC systems.	5.05 Services single and three-phase AC systems.					
	6. Maintains DC systems.	6.01 Inspects DC systems.	6.02 Replaces DC systems.	6.03 Troubleshoots DC systems.	6.04 Repairs DC systems.	6.05 Services DC systems					
	7. Maintains grounding, bonding and cathodic protection systems.	7.01 Inspects grounding, bonding and cathodic protection systems.	7.02 Replaces grounding, bonding and cathodic protection systems.	7.03 Troubleshoots grounding, bonding and cathodic protection systems.	7.04 Repairs grounding, bonding and cathodic protection systems.	7.05 Services grounding, bonding and cathodic protection systems.					

* NOT COMMON CORE

BLOCKS	TASKS	SUB-TASKS				
	8. Maintains seismic restraint systems.	8.01 Inspects seismic restraint systems.	8.02 Replaces seismic restraint systems.	8.03 Repairs seismic restraint systems.		
C **Power Distribution and Generating Systems**	**9.** Maintains high voltage power distribution systems.	9.01 Inspects high voltage power systems.	9.02 Replaces high voltage power systems.	9.03 Troubleshoots high voltage power systems.	9.04 Repairs high voltage power systems.	9.05 Services high voltage power systems.
	10. Maintains low voltage power distribution systems.	10.01 Inspects low voltage power systems.	10.02 Installs low voltage power systems.	10.03 Troubleshoots energized and non-energized low voltage power systems.	10.04 Repairs low voltage power systems.	10.05 Services low voltage power systems.
	11. Maintains direct current power systems.	11.01 Inspects direct current power systems.	11.02 Replaces direct current power systems.	11.03 Troubleshoots direct current power systems.	11.04 Repairs direct current power systems.	11.05 Services direct current power systems.
D **Electrical Equipment**	**12.** Maintains rotating equipment and associated controls.	12.01 Inspects rotating equipment and associated controls.	12.02 Replaces rotating equipment and associated controls.	12.03 Troubleshoots rotating equipment and associated controls.	12.04 Repairs rotating equipment and associated controls.	12.05 Services rotating equipment and associated controls.
	13. Maintains drives and associated controls.	13.01 Inspects drives and associated controls.	13.02 Replaces drives and associated controls.	13.03 Troubleshoots drives and associated controls.	13.04 Repairs drives and associated controls.	13.05 Services drives and associated controls.
E **Emergency and Standby Systems**	**14.** Maintains uninterruptible power supply systems (UPS).	14.01 Inspects uninterruptible power supply systems (UPS).	14.02 Replaces uninterruptible power supply systems (UPS).	14.03 Troubleshoots uninterruptible power supply systems (UPS).	14.04 Repairs uninterruptible power supply systems (UPS).	14.05 Services uninterruptible power supply systems (UPS).

* NOT COMMON CORE

BLOCKS	TASKS	SUB-TASKS						
	15. Maintains standby power generating systems.	15.01 Inspects standby power generating systems.	15.02 Replaces standby power generating systems.	15.03 Troubleshoots standby power generating systems.	15.04 Repairs standby power generating systems.	15.05 Services standby power generating systems.		
F **Communication Systems**	**16.** Maintains alarm systems.	16.01 Inspects alarm systems.	16.02 Replaces alarm systems.	16.03 Troubleshoots alarm systems.	16.04 Repairs alarm systems.	16.05 Services alarm systems.		
	17. Maintains paging systems.	17.01 Inspects paging systems.	17.02 Replaces paging systems.	17.03 Troubleshoots paging systems.	17.04 Repairs paging systems.	17.05 Services paging systems.		
	18. Maintains audio-visual systems.	18.01 Inspects audio-visual systems.	18.02 Replaces audio-visual systems.	18.03 Troubleshoots audio-visual systems.	18.04 Repairs audio-visual systems. *	18.05 Services audio-visual systems.		
G **Control Systems**	**19.** Maintains protection devices.	19.01 Inspects protection devices.	19.02 Replaces protection devices.	19.03 Troubleshoots protection devices.	19.04 Repairs protection devices.	19.05 Services protection devices.		
	20. Maintains input/output field devices.	20.01 Inspects input/output field devices.	20.02 Replaces input/output field devices.	20.03 Troubleshoots input/output field devices.	20.04 Repairs input/output devices.	20.05 Services input/output field devices.		
	21. Maintains programmable logic controllers (PLC).	21.01 Inspects programmable logic controllers.	21.02 Replaces programmable logic controllers.	21.03 Troubleshoots programmable logic controllers.	21.04 Repairs programmable logic controllers.	21.05 Services programmable logic controllers.	21.06 Configures programmable logic controllers.	21.07 Optimizes programmable logic controllers.

* NOT COMMON CORE

BLOCKS	TASKS	SUB-TASKS				
H Climate/ Environment Control Systems	**22.** Maintains distributed control and SCADA systems.	22.01 Inspects distributed control and SCADA systems.	22.02 Replaces distributed control and SCADA systems.	22.03 Troubleshoots distributed control and SCADA systems.	22.04 Repairs distributed control and SCADA systems.	22.05 Services distributed control and SCADA systems.
	23. Maintains electrical components of heating systems.	23.01 Inspects electrical components of heating systems.	23.02 Replaces electrical components of heating systems.	23.03 Troubleshoots electrical components of heating systems.	23.04 Repairs electrical components of heating systems.	23.05 Services electrical components of heating systems.
	24. Maintains electrical components of cooling systems.	24.01 Inspects electrical components of cooling systems.	24.02 Troubleshoots electrical components of cooling systems.	24.03 Repairs electrical components of cooling systems.	24.04 Services electrical components of cooling systems.	
	25. Maintains building automation systems.	25.01 Inspects building automation systems.	25.02 Replaces building automation systems.	25.03 Troubleshoots building automation systems.	25.04 Repairs building automation systems.	25.05 Services building automation systems.
	26. Maintains environmental regulating systems.	26.01 Inspects environmental regulating systems.	26.02 Replaces environmental regulating systems.	26.03 Troubleshoots environmental regulating systems.	26.04 Repairs environmental regulating systems.	26.05 Services environmental regulating systems.